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Thema

“Happiness, Relative Income and the Specific Role of Reference Groups”

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List of Figures and Tables

Abbreviations

BHPS	British Household Panel
ESS	European Social Survey
GDP	Gross Domestic Product
GDR	German Democratic Republic
GSOEP	German Socio-Economic Panel
IMF	International Monetary Fund
ISCED	International Standard Classification of Education
NSFH	National Survey of Families and Households
OLS	Ordinary Least Squares
PUMA	Public Use Microdata Area

1 Introduction

Many scientific disciplines such as philosophy, sociology, psychology, medicine and neuroscience deal with happiness. Over the last decades, economists also started to pay attention to the relation of happiness and its economic determinants. Next to personal and demographic characteristics, a wide ranging literature has shown that also absolute income and wealth, relative income as well as macroeconomic conditions (inflation, general unemployment) strongly matter when explaining happiness (see MacKerron (2012) for a review).

In particular, there are a variety of studies that show that absolute income is positively correlated with individual well-being, but find at the same time that average income of the reference group (comparison income) affects individual well-being most often negatively (Clark et al., 2008). Although the results allover the literature are quite consistent, there is a large variety how the reference group is defined. For example, some authors assume that people compare themselves with people living in the same area (Luttmer, 2005; Graham & Felton, 2006) or with people inside the same age range (McBride, 2001). Others define the reference group more precisely and assume that people compare themselves with people of same age, same education and same area of living (Ferrer-i-Carbonell, 2005). However, to the best of my knowledge, there is no systematic empirical research on the impact of different reference group specifications on life satisfaction in happiness regressions. Therefore, I investigate in this master thesis to what extent different reference group specifications alter the statistical impact of comparison income on happiness regarding sign, magnitude and statistical significance.

To do so, I review in the first part of the thesis the literature and state empirical regularities as well as theoretical considerations regarding absolute and relative income. In the second part of the thesis, I use the European Social Survey (ESS) as data basis to analyze empirically how different reference group specifications alter the effect of comparison income in happiness equations. The results show that the specification of the reference group matters, since some specifications produce significant and others produce insignificant coefficients.

Further, the findings suggest that also the sub-sample plays a crucial role. For example, in the sub-sample containing old people (40 years and older), comparison income has in most specifiactions a negative impact on satisfaction. In contrast, in the sub-sample containing only young people (younger than 40 years), comparison income has, dependent on the reference group specification, an insignificant or even positive effect on happiness.

The remainder of the thesis is structured as follows. In chapter 2, I describe shortly how happiness can be measured and what kind of obstacles may occur. Chapter 3 serves to present a review on the economics of happiness, in particular focusing on the relation between absolute income and happiness. In the following chapter 4, I provide a detailed overview about the role of relative income when explaining life satisfaction. This will be continued in chapter 5, where I address reference groups and their specifications more extensively. Based on this, I perform an empirical study about the impact of different reference group specifications on life satisfaction with the help of the European Social Survey (ESS), which is shown in chapter 6. Lastly, I conclude shortly in chapter 7.

2 Measurement of Happiness in Economics

In economics, the measurement of happiness has often been discussed. Usually, the assumption is made that the concept of happiness[1] is closely linked to the utility concept. Hence, when economists ask for well-being or happiness, they aim at measuring the underlying utility. Although this idea is straight forward, there has been a discussion whether it is sufficient just to ask for happiness (subjective well-being) or if it is not more plausible to rely on actual decisions (objective well-being).

Objective well-being is mainly based on the axiomatic concept of revealed preferences, where the actual choice reveals all information needed to measure the individual utility (Frey & Stutzer, 2002, p. 404). Hence, individual behavior and the individual choice between tangible goods, services and leisure determine implicitly the best decision an individual can make to approach the highest possible utility level (Frey, 2008, p. 15). However, there has emerged an extensive literature about anomalies and irrationalities[2] in decision making so that it has to be questioned if utility can be derived sufficiently by actual decisions (Frey, 2008, p. 16). Moreover, the fact that the concept of revealed preferences misses out procedural utility[3] points out a further shortcoming of the positivistic view considering only actual decisions.

Subjective experiences are not objectively observable and therefore often declared as "unscientific", in particular since everyone has own perceptions about what happiness or the "good life" really is (Frey, 2008, p. 15). However, vast studies apply the subjective well-being concept, where researchers rely on the answers of the respondents when asked about their

1 The terms happiness, satisfaction and well-being are used interchangeably.
2 Frey (2008, pp. 15-16) gives an overview about several anomalies (e.g. emotions, intrinsic motivation or status) and irrationalities (e.g. preference inconsistencies).
3 Procedural utility describes that conditions and processes are also valued by people. (Frey, 2008, p. 107)

happiness. Generally, this concept is described to be much broader than objective well-being, since it understands utility in hedonistic terms (experienced utility) and also accounts for procedural utility (Frey & Stutzer, 2002, p. 405; Frey, 2008, p. 16). Consequently, the concept allows to measure individual well-being directly, although there is some doubt if reported well-being serves well as a proxy for decision utility[4] (Frey, 2008, p. 16).

The measurement of happiness in economics is mainly based on subjective survey data relying on the validity of the subjective well-being concept. More specifically, the measurement of happiness offers various possibilities. Beside multiple question items, where different questions are asked to identify an underlying dimension of happiness, overall life happiness is most frequently inquired by one single question. Since answers are based on individual judgments, subjective survey data tend to be biased due to the wording of questions, the order of questions, the scales applied, the actual mood or the selection of information processed (Frey, 2008, p. 19).

To discuss these obstacles in greater depth, table 1 shows different surveys, where people are asked about their overall life satisfaction.

Table 1: Selected Surveys and Questions about Happiness

Survey	**(Single) Question**
Euro-Barometer Survey	"Taking all together, how happy you say you are: very happy, quite happy, not very happy, not at all happy?" (4-point scale)
World Values Surveys	"All things considered, how satisfied are you with your life as a whole these days?" (11-point scale)
European Social Survey	"Taking all things together, how happy would you say you are?" (11-point scale)
German Socio-Economic Panel	"How satisfied are you with your life, all things considered?" (10-point scale)
British-Household Panel	"How dissatisfied or satisfied are you with your life overall?" (7-point scale)
US General Social Survey	"Taken all together, how would you say things are these days – would you say you are very happy, pretty happy, or not too happy?" (3-point scale)

Source: Codebooks of Euro-Barometer Survey (2005, p. 172), World Value Surveys (2004, p. 32), European Social Survey (2012), German Socio-Economic Panel (2012, p. 35), British-Household Panel (2012, p. 217) and US General Social Survey (2009, p. 277)

4 **C**losely related research areas show that reported variables serve well to proxy actual decisions. Examples are that future job quits can be predicted by reported job satisfaction, that the probability of a future divorce can be explained by the satisfaction gap between spouses, that there exists a strong correlation between happiness and productivity as well as that suicides can be predicted by well-being data. (Ferrer-i-Carbonell, 2012, p. 49-50)

As the questions show, there are differences in the order of words as well as differences in the words used. The Euro-Barometer Survey, the European Social Survey as well as the US General Social Survey use the word "happy", the other surveys listed stick to "satisfied". It remains open if "happiness" and "satisfaction" really mean the same, i.e. have the same connotations[5] for the respondents, or if they would answer different if one word would be replaced by an other. An argument for the conceptual difference of both words would be that "life satisfaction refers to cognitive states of consciousness, whereas happiness is emotional and mainly concerns intimate matters of life" (Caporale et al., 2005, p. 43).

Another problem may arise due to the placement of the life satisfaction question in the questionnaire. For example, Easterlin and Anglescu (2009, p. 5) report that overall life satisfaction of respondents tend to be downward biased if there are questions about finances inserted before. The reason is that people are in general less satisfied with their financial situation than with their life as whole leading to a lower score in overall life happiness.

In addition, also the scales applied may matter. As table 1 shows, the scales applied vary from 3-point scales ("very happy", "pretty happy" or "not too happy" in the US General Social Survey) to 11-point scales ("0"– extremely unhappy to "10" – extremely happy in the European Social Survey). Concerning 3-point scales, one could argue that happiness cannot be captured as precise as in 11-point scales due to the missing possibility of differentiation. Different scales may also lead to problems when merging different data-sets. For example, Easterlin and Anglescu (2009, p. 3) solve this problem by transferring the Euro-Barometer 4-point scale to a 10-point scale by a linear transformation in order to be able to work with a merged data-set. Of course, it has to be questioned if rescaling does alter the validity of the happiness data, independently on how we understand the variable measuring happiness.

There are mainly three possibilities how the variable measuring happiness can be understood (MacKerron, 2012, p. 712; Ferrer-i-Carbonell and Frijters, 2004, p. 643):

I. Reported happiness (R) is understood as a positive monotonic transformation of an underlying variable of interest "true happiness" or "utility" (U), where $R'(U) > 0$.
II. Reported happiness can be compared ordinally between people such that if $R_i > R_j$ then $U_i > U_j$, where the subscripts i and j represent different individuals.

5 **V**eenhoven (2012, p. 339-340) analyzes this by posing three different happiness questions (happiness-in-life, satisfaction-with-life and best/worst possible life) in eleven mono-lingual nations. The results show that the rank order of happiness is nearly the same for all three questions, i.e. if Australians rank highest when asked about their satisfaction-with-life, they are probably also highest or very high ranked when asked about happiness-in-life and best/worst possible life. (Germans seem to be an exception. They understand "happiness" (Glück) and "satisfaction" (Zufriedenheit) somewhat different.) Thus, there is some evidence that the connotations of "satisfaction" and "happiness" are similar across nations.

III. Reported Happiness can be compared cardinally between people such that the equation $R_i - R_j = U_i - U_j$ holds.

In econometric terms, the difference between these three assumptions is of particular importance. When assuming that reported happiness is cardinally comparable, a standard OLS regression is an appropriate tool. In contrast, if reported happiness is assumed to be ordinally, ordered probit or logit models need to be applied to estimate the impact of particular determinants on reported happiness correctly (MacKerron, 2012, p. 712-713). Since the main purpose of happiness measurement is rather to identify determinants than making absolute comparisons, the assumption that reported happiness is cardinally comparable is mostly not necessary (Frey, 2008, p. 19). Consequently, how the comparability of reported happiness is treated (cardinally or ordinally) depends on not only on the scales applied[6] but also on the research question.

Distortions in happiness research may also arise due to comparisons across countries. For example, Veenhoven (2012, p. 333) points out potential cultural measurement biases and the relative importance of happiness in different cultures. An example of a cultural measurement bias is the desirability bias, where differences in reported happiness may be caused by moral appreciations. In this case, people are likely to over-report happiness in countries where happiness is morally desired such as the US[7] (Veenhoven, 2012, p. 342). The idea that happiness is of relative importance in different cultures refers to the view that happiness is treated as a social construct.[8] Then, also the determinants of happiness would rather vary across countries than follow an universal pattern. Veenhoven (2012, p. 347), however, shows that this hypothesis cannot be supported by the data and provides evidence that there are similar conditions across nations determining happiness.

To sum up, reported overall life happiness is commonly measured by a single question, although different surveys use partly different wording and scaling. It is from an econometric view also of particular importance to assume, if happiness is compared ordinally or if it is compared cardinally across people. The measurement of happiness may also be biased due to different cultures and languages.

6 **R**easonably, a 11-point scale (World Values Survey) ranging from "completely dissatisfied" (0) to "completely satisfied" (10) is more easily assumed as cardinally comparable than a 3-point scale (US General Social Survey) with the characteristics "very happy", "pretty happy" and "not so happy".

7 **T**here is the claim that the high levels of reported happiness in the US should be discounted to obtain unbiased information about happiness. (Veenhoven 2012, p. 342)

8 **T**he phrase social construct means in this context that "happiness depends on shared notions about life and that these collective notions frame individual appraisals". (Veenhoven, 2012, p. 346)

3 The Economics of Happiness

The economics of happiness goes back to the works by Easterlin (1974). In his seminal paper "Does Economic Growth Improve the Human Lot?" Easterlin analyzes the relation between income and happiness. The result, well-known as the Easterlin-Paradox, shows that within one country there is a strong positive correlation between happiness and income at a point in time, but no systematical correlation between these variables over time (Easterlin, 1974, p. 118). On the other hand, across countries, the correlation between income and happiness turns out to be much weaker than within countries, whereby there is again no significant correlation over time (Easterlin, 1974, p. 118).

The empirical evidence first provided by Easterlin (1974) is also supported by more recent happiness studies, which find only little, if any, evidence that happiness and income are related across countries and over time (Graham 2005, p. 45). To understand the relation between absolute income and happiness in greater depth[9], the following chapter focuses more detailed on the empirical regularities first sketched by Easterlin (1974) and confirmed by a variety of other studies. Of course, this chapter also points to underlying theories, which try to explain the empirical regularities and their interactions. In addition, the chapter sketches the relation between other macroeconomic variables (unemployment, inflation, inequality) and happiness to give a comprehensive overview about the economics of happiness.

3.1 The Relation between Absolute Income and Happiness

The relation between income and happiness has several dimensions. The following chapter focuses firstly on the cross-country level, where average happiness and GDP per capita are treated in a cross-country relation. Thereafter, the link between absolute income and happiness within countries is shortly explored. Lastly, the time-series dimension is considered and a theoretical approach is presented to explain the empirical difference between the short-run and the long-run relation between happiness and income.

Research on income and happiness with macro data across countries has shown that wealthier countries seem to be happier than poor ones. However, this relation seems to hold only up to a certain level. Beyond this level, the relation seems to vanish. (Frey & Stutzer, 2002, p. 416;

9 This chapter focuses on the relation of absolute income and happiness. The role of relative income will be discussed in chapter 4.

Graham, 2005, p. 45)

Easterlin and Anglescu (2009, p. 6) report that life satisfaction increases with absolute GDP per capita but at diminishing rates. Increases in GDP per capita have therefore a much larger impact on poor countries than on rich countries.

As a consequence, most authors identify a concave relationship between GDP per capita and average happiness. However, this relation has to be treated critically, since a higher GDP per capita is often accompanied by other factors impacting positively on happiness. For example, countries with a high GDP per capita generally have a more stable democracy, a higher health standard and more secure basic human rights (Frey & Stutzer, 2002, pp. 416-417).

Hence, macro data provide often only a very weak relation between country GDP per capita and happiness, in particular when national averages are used and it is controlled for education, unemployment and other factors moderating the strength of the relationship between GDP and income (Ferrer-i-Carbonell, 2012, p. 42; Caporale et al., 2009, p. 42). At least for developed countries, a policy implication would be that economic growth is not of primary importance so that politicians should also take education, unemployment and other macroeconomic variables into account when maximizing happiness in the society (Clark et al., 2008, p. 96).

The relation between income and happiness across countries is only one part. The other part is to compare income and happiness within countries. A variety of empirical evidence indicates that a relation between income and happiness within countries can be found.

To start with, Easterlin (2001, p. 468) shows that – based on the US General Social Survey in 1994 – happiness varies directly with income groups, where the average happiness score of each income group ranges from 1.8 to 2.8 on a three point scale[10]. This means that individuals of higher income groups tend to be happier. However, it needs to be noted that the income groups explain only little of the differences in happiness among persons (correlation coefficient 0.2). This indicates that also other factors are important. Moreover, the introduction of other control variables such as unemployment or education weakens the relationship between income and happiness further.

Frey and Stutzer (2002, p. 409) present similar results also using the US General Social Survey but analyzing the time periods from 1972-1974 and 1994-1996. They argue that people with higher income have not only advantages in achieving what they desire, but also benefit strongly from a higher status in the society. However, the relation between income and happiness is suggested to be non-linear, since the data show diminishing marginal happiness in absolute income.

10 **T**he 3-point-scale sets 'very happy'=4, 'pretty happy'=2 and 'not too happy'=0. (Easterlin, 2001, p. 468)

There are further studies presenting similar results such as Blanchflower and Oswald (2004, p. 1381) for developed countries or Graham and Pettinato (2002, p. 100) for developing countries. The only difference between these studies can be found regarding the slope of the happiness-income relationship at a point in time, which is larger within developing countries (Clark et al., 2008, p. 97).

To fully understand the relation between happiness and income, it is not sufficient to only compare within and across countries. Rather, the relation between income and happiness depends strongly on the time dimension being treated, namely the short-run and the long-run dimension.

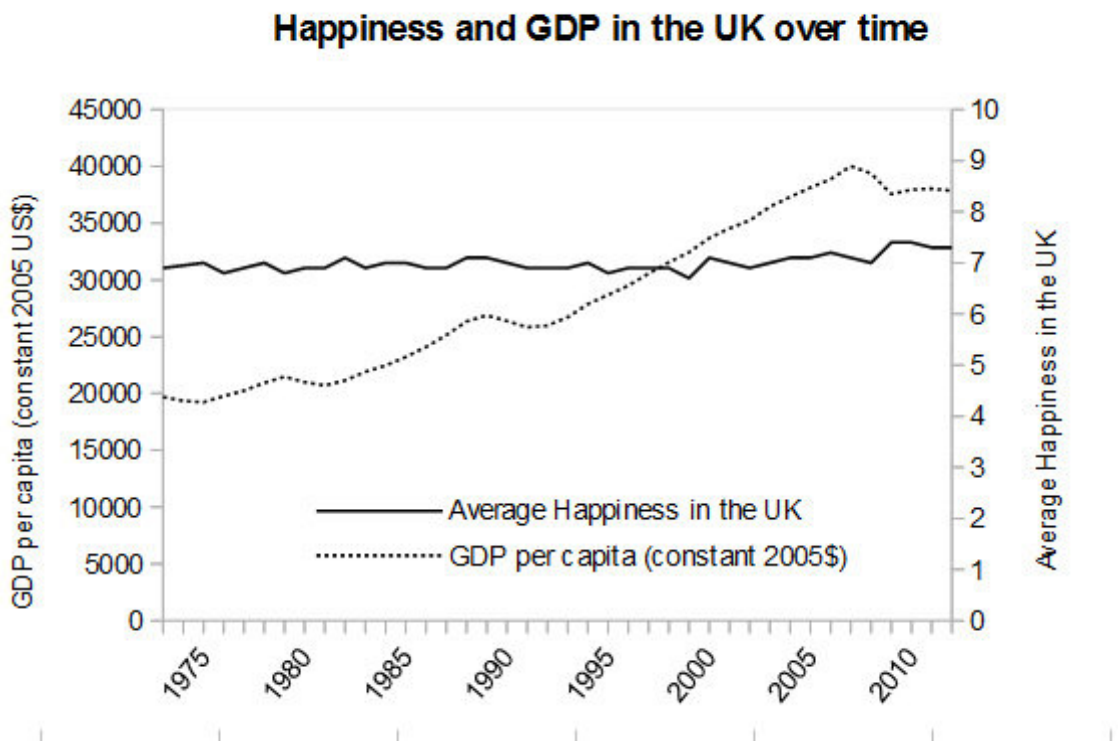
At a point in time, people with a higher income are, on average, more happy than those with less income (Easterlin, 1974; Easterlin, 2001, p. 465). In addition, time series show that happiness and GDP per capita are positively related in the short run.

As an example, Easterlin and Anglescu (2009, p. 10) point to transition countries such as the former GDR, Estonia or the Russian Federation. Here, a co-movement of both variables is not only visible but also significant in statistical terms, since the results of regressing the growth rates of average happiness and GDP per capita on each other show a strong positive relation (Easterlin & Anglescu, 2009, p. 22). Hence, in transition countries, a negative change in GDP per capita is related with a negative change in average life satisfaction and vice versa (Easterlin & Anglescu, 2009, p. 10).

In contrast, over the long run, the relation between income and happiness vanishes such that the average happiness of a cohort remains constant (Easterlin, 2001, p. 465) or has even declined over the same period (Frey & Stutzer, 2002, p. 413). This is in particular puzzling since income of the most countries in the world has grown substantially (Easterlin, 2001, p. 465). For example, Easterlin and Anglescu (2009, p. 8-9) find no significant relation between the growth rate of happiness and the growth rate in GDP per capita in the long run[11], independent of treating developed countries, developing countries, transition countries or all countries together. Furthermore, findings show that the average happiness of a cohort remains constant over time in the US, although income has increased considerably (Easterlin, 2001, p. 469). Lastly, observing a time period from 1973 to 2012, the following graph (figure 1) shows the relation between average happiness and GDP per capita for the UK over time. Although the GDP per capita has nearly doubled, average happiness remained stable.

11 **C**ritically, the regression does not include other control-variables.

Figure 1: Happiness and GDP in the UK over time



Source: World Database of Happiness (2013) and World Development Indicators (2013)

Despite this strong empirical evidence in the long-run, the results need to be treated critically. On the one hand, Clark et al. (2008, p. 97) report empirical evidence that real GDP in East Germany has grown substantially between 1991 and 2002[12], whereby also reported happiness rose considerably over the same period. On the other hand, most of the results offer only bivariate relations such that they may be sensitive to the observation period and to the variables controlled for (Frey & Stutzer, 2002, p. 414). For example, figure 1 sketches only average happiness and the GDP per capita in the UK and misses out other socio-demographic and macroeconomic variables.

The relation between happiness and income has been treated differently according to the time period. Hence, it has to be questioned why there is such a disparity between the short and the long run. To understand this, findings about past and prospective happiness offer some instructive information.

Interestingly, people systematically overestimate their future or prospective happiness and underestimate their happiness in the past, independently on where people are located in the life cycle. On average, they believe that they have been worse off in the past and they will be

12 **O**f course, this period could also be considered as short-run. Another problem is that Clark et al. (2008, p. 97) present only bivariate correlations.

better off in the future in comparison to their current happiness level (Easterlin, 2001, p. 471). In particular, this effect is observable by younger respondents, who envisage greater income changes than older respondents (Easterlin, 2001, p. 471). However, when respondents are asked again after a period of about five years, happiness is more or less on the same level as before meaning that it stays on average unchanged.

The main argument is that people link higher future income expectations with more happiness in the future, which also explains why younger people envisage greater changes in happiness than older since they expect relatively higher increases in income. Hence, Frey and Stutzer (2002, p. 403) conclude that people associate income positively with happiness, which seems to be true in the short run but not over the long run.

Consequently, a theory needs to explain three empirical regularities. First, people are happier at a given point in time when their income is higher. Second, people underestimate their past happiness and overestimate their future happiness. Lastly, happiness stays more or less unchanged over the life cycle. (Easterlin, 2001, 472)

These regularities can be explained by the process of hedonic adaption, in which people always adapt their aspirations to new situations (Frey & Stutzer, 2002, p. 414). An increase in income, for example, will also increase happiness in the short run. Over time, however, aspirations rise as well such that in the end happiness converges back to the initial level. But why do people predict their future happiness as well as their past happiness on average incorrectly? An answer is given with the help of figure 2.

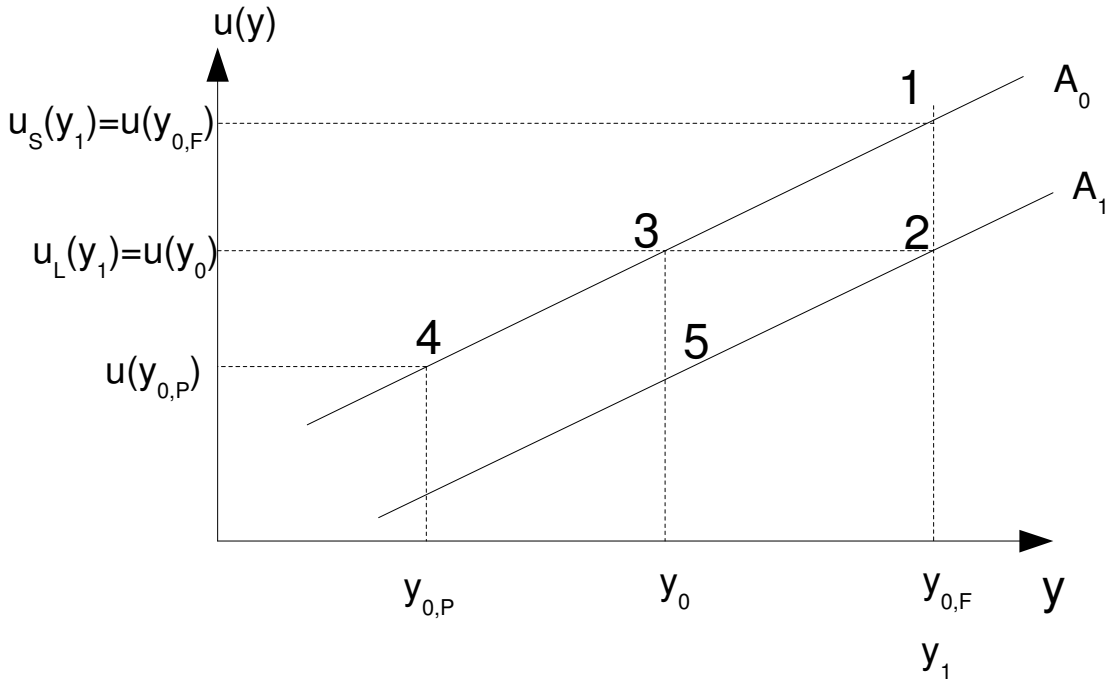
Starting with income y_0, the representative individual achieves the utility level $u(y_0)$ lying on the aspiration curve[13] A_0 at point 3. If the representative individual expects now a higher future income, say $y_{0,F}$, the individual also associates a higher future utility level $u(y_{0,\ F})$ represented at point 1. Similarly, if the representative individual has to predict its past happiness, the individual typically report a lower utility $u(y_{0,P})$ based on past income $y_{0,P}$ represented at point 4. Hence, the representative individual bases its predictions in the past and in the future on its current aspirations A_0.

Now, income of the representative individual rises from y_0 to y_1. Then, in the short term, utility rises as well from $u(y_0)$ to $u_S(y_1)$ represented again at point 1. However, the higher actual income (y_1) alters also aspirations over time, such that the aspiration curve A_0 shifts gradually to the right until reaching the curve A_1. In this new situation, the utility gained from income level y_1 is only $u_L(y_1)$, which equals the initial utility level $u(y_0)$. If an individual

13 **T**he aspiration curve states the functional relation between absolute income and utility and shifts to the right, when aspirations rise.

would now predict its past utility level, the individual would end up at the utility level corresponding to point 5.

Figure 2: Aspirations and Adaption



Source: own representation based on Easterlin (2001, p. 473)

Hence, this model can easily explain the empirical regularities that have been found. The resulting implications are that people make predictions to the past and in the future based on their current aspiration level. They commonly neglect to anticipate changes in their aspiration level when income changes. Furthermore, income and happiness are positively related in the short run, but the relation vanishes over time as the aspiration level adapts to the new income situation.

Consequently, Frey and Stutzer (2002, p. 415) conclude that rising aspirations are responsible for the fact that people are never satisfied and want to achieve ever more. The phenomenon of "hedonic adaption" is then also often associated with the phrase "hedonic treadmill" meaning the effect of higher income lasting only shortly on happiness. Graham (2005, p. 47) lastly concludes that after basic needs are met, the importance of absolute income does not matter anymore to happiness in contrast to relative income[14].

In particular in psychology, the theory of "hedonic adaption" is also called "setpoint theory". The "setpoint theory" states that every individual has a unique happiness setpoint, which is

14 **T**he effect of relative income will be discussed in greater detail in chapter 4.

formed by personality and genetic heritage. The idea is that even after major life events such as marriage, unemployment or serious injury or diseases the individual converges over time back to its individual setpoint. This indicates that no permanent positive or negative deviation from the setpoint is possible. (Easterlin, 2006, p. 466; Graham, 2005, p. 47)

3.2 Unemployment, Inflation and Inequality

Beside income, unemployment has also an important role when explaining happiness. Studies focusing on unemployment basically distinguish between personal and general unemployment.

Personal unemployment asks to what extent unemployment affects happiness of an individual by becoming unemployed and later reemployed. Frey and Stutzer (2002, p. 419) report that unemployed people report systemically lower happiness than employed persons with similar characteristics. Oswald (1997, pp. 1822/1825) reports that the unemployed are very unhappy and have a higher probability to commit suicide, whereby the commitment of suicide is understood as extreme unhappiness. Ferrer-i-Carbonell (2012, p. 37) reviews that personal unemployment has a severe impact on happiness which is long lasting and remains even after becoming reemployed. In addition, unemployment may alter the setpoint for life satisfaction sustainably, which means that negative effects of unemployment persist over time such that people do not adapt to unemployment as they would do to changes in income (Lucas et al., 2004, pp. 8-13; Clark et al., 2008, p. 222; Ferrer-i-Carbonell, 2012, p. 45).

To examine the net effect of unemployment, it has also been controlled for income losses and the benefits from the social systems. The results show that there are also severe non-pecuniary costs of unemployment addressed as psychic and social costs. The phrase psychic costs subsumes depression and anxiety, loss of self-esteem and personal control. In addition, unemployed individuals suffer from worse mental health, have a higher death rate, commit more likely suicide and consume higher quantities of alcohol. The social costs of being unemployed are that the unemployed are often stigmatized by the society, in particular in societies where the job position is inherently linked to the position in life. (Frey & Stutzer, 2002, p. 419-420; Oswald, 1997, p. 1825; Ferrer-i-Carbonell, 2012, p. 45)

It is, however, not clear that the causality runs only from unemployment to unhappiness or if there is also reverse causality (Frey and Stutzer, 2002, p. 419). For example, Graham et al. (2004, p. 319) report that happier people perform better in the labor market and, therefore, are

more likely to earn more income in the future. Hence, happier people are more likely to be employed since their performance in the job is better and unhappy people are more likely to become unemployed due to their worse performance. Then, the causality would run from unhappy to unemployed.

Happiness is not only affected by personal unemployment but also by general unemployment. People are negatively affected by general unemployment since the possibility of becoming unemployed increases (Frey & Stutzer, 2002, p. 420).

How strong the effect of unemployment on happiness is depends strongly on the reference group. Frey and Stutzer (2002, p. 421) report that individuals evaluate their own situation relative to others such that unemployed individuals are on average less unhappy if also other individuals are unemployed, in particular the partner or a large part of the individuals living in the same region. Hence, increasing general unemployment lowers an individual's happiness if that individual is employed, but it increases an individual's happiness if that individual is already unemployed (Frey, 2008, p. 53). The argument for this phenomenon is mainly that people are less stigmatized by unemployment such that psychic and social effects are partly mitigated (Frey & Stutzer, 2002, p. 421).

Unemployment is not the only variable people care about. Also inflation plays a crucial role when treating macroeconomic conditions in a country. There has been a wide ranging discussion about the trade-off between inflation and unemployment in the short- and long-run, mostly known in the context of the Phillips-curve (Friedman 1977, Samuelson & Solow, 1960). For the purpose of happiness research, it is most insightful to analyze which of these variables are more relevant for the people in a country.

In a study covering twelve European countries within the period of 1975 to 1991, Di Tella, MacCulloch and Oswald (2001, p. 335-341) find that a one percent increase in the unemployment rate reduces happiness by 0.028 points on a four-point scale, while a one percent increase in the inflation rate reduces happiness by only 0.012 points. Hence, unemployment depresses happiness more than inflation. This is even the case after controlling for country fixed effects, year fixed effects and country-specific time trends. Then, the estimates show that a 1-percentage-point increase in the unemployment rate would be marginally compensated by a 1.7-percent decrease in the inflation rate.

Lastly, income inequality also may have adverse effects on happiness. In general, income inequality can be interpreted as a sign of future opportunities or as a sign of injustice. Alesina, Di Tella and MacCulloch (2004, p. 2009) report that happiness is lowered by income inequality even after controlling for individual characteristics, year and country dummies. The

effect is, however, statistically larger in Europe than in the US. Furthermore, there are huge differences across groups. In Europe, the poor and the political left-winged are unhappier than the rich and the politically right-winged. In the US, however, to be poor or left-winged is not correlated with happiness. Based on the Gini coefficient, Schwarze and Härpfer (2007, p. 233) find that Germans are inequality averse. An increase in the Gini coefficent leads to a reduction of average life satisfaction.

To sum up, the income paradox first stated by Easterlin (1974) – a positive relation between income and happiness at a point in time, but no systematic relation over time – can be solved by applying the idea of rising waspirations and other control variables like unemployment, inflation or income inequality, in particular when basic needs are met.

In addition, in particular within a country, the literature also refers to the importance of relative income when explaining differences in happiness. Relative income is, however, always related to a particular reference group, which is often not easy to define. Therefore, the following chapter reviews the literature regarding relative income, states the results and analyzes, why a particular reference group has been chosen.

4 The Role of Relative Income

The theoretical idea that relative status – or in particular relative income – matters for happiness and other domains in life has a long tradition. For example, Frank (2005, p. 138) refers to the importance of relative position (income) in a biological and evolutionary context stating that "natural selection will favor individuals with the strongest concerns about relative resource buildings."

An interesting finding is also provided by Solnick and Hemenway (1998), who asked students, staff and other individuals of the Harvard School of Public Health which of the following scenarios A and B they would prefer:

> *A: Your current yearly income is $50,000; others earn $25,000.*
> *B: Your current yearly income is $100,000; others earn $200,000.*

The results show that about 50 percent of the respondents[15] prefer A. Although this study is based on a very small population in a locally and societal narrowed area, the results strongly indicate that there are people who are more concerned about their positional status than their absolute status, at least in a situation where their basic needs can be met.

In the context of job satisfaction, Clark and Oswald (1996, p. 359) find that workers reported job satisfaction is negatively related to their comparison wage rates. In a health economics context, Gravelle and Sutton (2009, p. 125) show that people report better health in Britain when their income is higher than the regional mean income. Fischer and Torgler (2006, p. 7) analyze the effects of the relative income position on social capital and find that social capital rises with relative income position.

The fact that relative values matter economically was firstly proposed by Duesenberry (1949), who made use of the 'demonstration effect' to explain in how far a family's consumption is affected by purchases made in the direct neighborhood (Solnick & Hemenway, 1998, p. 375). He already suggested that the individual consumption function depends on the current income of other people (Alvarez-Cuadrado & Van Long, 2008, p. 2).

More recently, economists pay more attention to relative income concerns when explaining happiness. Some results show that individual's happiness seems to be more affected by relative income than by own absolute income (MacKerron, 2012, p. 720). Further, some

15 **5**2 % of students (n=159) and 35 % of others (n=79) prefer the world in which they were relatively better off, i.e. scenario A. (Solnick & Hemenway, 1998)

findings suggest that relative income can affect reported happiness in two possible directions. To underline this, the following chapter shortly reviews how relative income actually may influence reported happiness in a positive (*social comparison effect*) or a negative (*tunnel effect*) manner. Second, the chapter also deals with some theoretical considerations, in particular how relative income can be incorporated in utility-functions and how it may help to explain the Easterlin-Paradox.

4.1 Empirical Evidence

There is a bulk of empirical literature examining the relation between relative income and reported happiness. Although most studies find that relative income matters for happiness, the direction of the effect is not always clear. In most cases, there is evidence that relative income – defined as the ratio y/y^*, where y^* is the 'reference group income' or 'comparison income' – has a positive effect on an individual's happiness such that people are better off when earning more income than the reference group (*social comparison effect*).[16] Somewhat contradictory, some studies also find that relative income has a negative effect on happiness. This means that people are on average happier when the income of the group income y^* rises. In this case, reference income is not interpreted is terms of enviousness or social comparisons but rather as informational value for future income prospects (*tunnel effect*).

4.1.1 Empirical Evidence for the 'Social Comparison Effect'

Using the data from the 1994 US General Social Survey (GSS), McBride (2001) finds that increases in absolute income affect happiness positively, while increases in relative income variables tend to increase happiness as well. McBride (2001, p. 264) applies two different reference groups, namely an internal and an external reference group. Applying the idea that people compare most of the time with people of their own age, the external reference group is defined as the average income of everyone, who is in the range of 5 years younger to 5 years older than the respondent. The reference group of an 35-year old is then the average income of all the people who are 30 to 40 years old. The internal reference group captures the idea that individuals have also an internally formed norm about income or consumption, which may be influenced by the standard of living of their parents (McBride 2001, p. 257). To

16 **T**hat people's happiness is negatively affected by a higher income of the reference group may not necessarily due to enviousness. It could also just mean that people use reference income to assess how good their own income is. (Ferrer-i-Carbonell, 2012, p. 43)

incorporate also this effect, “parents standard of living” is measured by the question: “Compared to your parents when they were at the age you are now, do you think your own standard of living is now: much better, somewhat better, about the same, somewhat worse, or much worse?” (McBride, 2001, p. 263). The results indicate that both internal and external reference groups have an impact on happiness. Generally, a higher income of the external reference groups reduces individuals happiness. Similarly, if somebody states that his or her standard of living is much worse than the standard of living of his or her parents, individual happiness is reduced. These results, however, need to be evaluated carefully since standard errors tend to be relative high in this study. In addition, there is also some evidence that relative-income effects might vary with income. For example, low income groups seem to be less affected by relative income variables rather by changes in own absolute income. In contrast, high income groups are more sensitive to changes in relative income variables than to absolute income variables (McBride, 2001, p. 271).

Blanchflower and Oswald (2004) analyze to what extent relative income affects happiness in Britain and the USA with the help of the Eurobarometer Survey (1973-1998) and the US General Social Survey (1972-1998). Having controlled for several control variables[17], relative income – spatially defined as the ratio of individual income to the state income per capita – affects happiness significantly positive in the US (Blanchflower & Oswald, 2004, p. 1375/1376). This means that a increase in the state income per capita while keeping the individual's income unchangd leads to a reduction in happiness. Lastly, it was also checked for the direction of comparisons. The data offer some evidence that relative-income comparisons are mainly upward, which was tested by the ratio of individual income to each of the five quintiles[18] of the average state income. The results show the strongest relation when income was set into relation with the fifth quintile[19] (Blanchflower & Oswald, 2004, p. 1379).

Having matched data from the National Survey of Families and Households (NSFH) with information on local earnings, so called Public Use Microdata Areas (“PUMAs”) with around 15,000 inhabitants each, also Luttmer (2005) finds that increasing earnings of the reference group – defined locally as average earnings in each PUMA region – lowers reported happiness. Thus, he concludes that own income is mainly evaluated with regard to the people living in the direct neighborhood.

17 **C**ontrol variables are: Time trend, age and age squared, dummies for demographic and work characteristics, years of education, and dummies for marital status.

18 **T**he first quintile represents the lowest income group. Hence, the fifth quintile represents the highest income group.

19 **T**he coefficients are strongly increase with the quintiles applied, i.e. the ratio of income over the first quintile state income is lowest, the ratio of income over the fifth quintile state income is highest. (Blanchflower & Oswald, 2004, p. 1379)

Also Layard et al. (2009) find that relative income plays a crucial role in the US as well as in West Germany for explaining reported happiness. For the US case, the authors use the US General Social Survey and define comparison income[20] as the average income in the same year in the same type of household (Layard et al., 2009, p. 5). The results are similar when a variable is included, which captures the perceived position of the respondents in the income distribution. For the West German case, the comparison income is defined as all people being in the same age, sex, and education group as the respondent (Layard et al., 2009, p. 7).

In the case of eighteen Latin American countries, Graham and Felton (2006) use an annual survey provided by the "LatinoBarometro organization" to analyze the relation between social inequality and happiness also checking for relative income effects. Since the measurement of income in developing countries is somewhat difficult[21], the "LatinoBarometro" also includes data on ownership of 11 goods and assets[22] as well as an interviewer's assessment of the household socio-economic status, which the authors use to compile a wealth index (Graham & Felton, 2006, p. 110-111). Based on the regression, which includes a vector of standard demographic variables, dummies for the country and the city size[23], and variables for own wealth as well as for the average wealth of the respondents country on the right hand side, the results show that increases in wealth of the reference group reduces an individual's reported happiness (Graham & Felton, 2006, p. 113).

Knight et al. (2009) analyze reported happiness and its determinants in rural China using the national household survey of 2002. Beside demographic and conventional economic variables (per capita household income, net wealth, working hours, unemployed), the study focuses also on spatial (e.g. household income in comparison to village average) and temporal (e.g. current living standard in comparison to past and expected future living standard) comparison variables. The results show that there is a strong and statistical significant comparison effect, whereby it does not matter if people address their reference group to be within or outside the village.[24] Respondents who stated to have a household income much above village average are happier than respondents who stated to have a household income much below village

20 **T**he term 'comparison income' means the same as income of the reference group.

21 **T**he measurement of income in developing countries is difficult due to the fact that most respondents work in the informal sector such that they cannot report a fixed salary. (Graham & Felton, 2006, p. 110)

22 **G**oods and assets range from drinking water, plumbing to computers and second homes. (Graham & Felton, 2006, p. 111)

23 **T**he dummy for city contains the characteristics small, medium and large cities. Small cities are defined to have less than 5000 respondents, large cities have more than 100000 respondents or are national capitals. (Graham & Felton, 2006, p. 114)

24 '**W**ithin village' contains the sub-sample of all persons who make comparisons with friends, neighbors or fellow villagers. In contrast, 'outside village' is the sub-sample of all persons who compare themselves with people living in the township, the county, the city or whole China. (Knight, Song, Gunatilaka, 2009, p. 641)

average[25], whereby the poor suffer more from having an income below average than the rich benefit from having an income above village average.[26]

Also Oshio et al. (2011) provide evidence for the happiness-relative income relation in Asia. The authors use data from the General Social Survey[27] conducted in China, Korea and Japan in 2006. The relative income variable is defined as the difference between the log individual or family income and the average income of the reference group, whereby the reference group contains the dimensions age, gender and educational accomplishment[28]. For both the individual relative income and the family relative income, the resulting coefficients are positive and significant for China, Korea and Japan[29], which confirms that the relative income hypothesis holds at the individual and at the family level (Oshio et al. 2011, p. 362-363).

Using a data-set containing 400 Venezuelan siblings, Kuegler (2009) defines an individual's sibling as the reference group. Siblings are considered to be the most proximate reference group since they have similar opportunities in life and have personal characteristics which are well-known to the survey respondents such that information asymmetries are unlikely[30] (Kuegler, 2009, p. 2). The results provide evidence that relative income matters since having a higher perceived income than one's sibling is positively linked to own reported happiness. Interestingly, when the data-set is restricted to respondents earning less than the median income, the relative income effect vanishes. This is supposed to be due to consumption sharing mechanisms, which overlap negative externalities of rank concerns for people with a very low income (Kuegler, 2009, p. 19).

Ferrer-i-Carbonell (2005) uses the German Socio-Economic Panel (GSOEP) to test not only the importance of the own income and the relevance of the income of the reference group but also the distance between the own income and the income of the reference group as well as

25 **T**he results are nearly identically for the sub-group of people, who state their reference group to be outside the village. If the household income of the respondent is much above the 'outside village' reference group household income, the respondents are significantly better off. (Knight, Song & Guantilaka, 2009, p. 641)

26 **A**lthough not mentioned in the paper, the asymmetry between the rich and the poor regarding the comparison income effect indicates that comparisons are mainly upward.

27 **T**he General Social Survey conducted in China, Korean and Japan (CGSS, KGSS and JGSS) is based on the US General Social Survey (GSS). (Oshio, Nozaki & Koboyashi, 2011, p. 353)

28 **A**ge was split up into five groups (20-29, 30-39, 40-49, 50-59, 60-69) and education into six categories (no formal qualification, lowest formal qualification, above lower formal qualification, higher secondary qualification completed, above higher secondary level, university degree completed). (Oshio, Nozaki & Koboyashi, 2011, p.354/356)

29 **A**t the individual relative income level, the coefficient is significant at the 1% level in China, but only at the 10% percent level in Japan and Korea. In contrast, at the family relative income level, the coefficient is only significant at the 10% percent level in China, but at the 5% percent level in Japan and Korea. The authors, therefore, conclude that Japanese and Koreans are more cautious about their family income and Chinese are more cautious about their individual income. (Oshio, Nozaki & Koboyashi, 2011, p.360/362)

30 **H**ence, the author assumes that individuals compare their own income most with income of people they have sufficient information about. The reference group contains then all the people which are most likely in accordance to proximity in characteristics and interaction. (Kuegler, 2009, p. 8)

the asymmetry of comparisons. Reference income is defined as the average income of the reference group, whereby the reference group contains all individuals with a similar education, inside the same age bracket and residence in the same region[31] (Ferrer-i-Carbonell, 2005, p. 1004-1005). Estimation results show that relative income has an influence on happiness. One the one hand, it is concluded that the larger the distance between an individual's income in comparison to the reference group income is, the happier an individual is. On the other hand, income comparisons are again asymmetric (mostly upward), which means that poorer individuals are negatively affected by the reference group income and that richer individuals are not better off by having an income above average (Ferrer-i-Carbonell, 2005, p. 1015).

Lastly, Caporale et al. (2009) focus on relative income while using the first two waves (2002 and 2004) of the European Social Survey (ESS) including 19 European countries. As reference group, the definition of McBride (2001) was applied[32] (all individuals that are in range of 5 years younger to 5 years older than the individual concerned) (Caporale et al., 2009, p. 46). For the full sample, the results show that the reference income has a statistically negative effect on individuals happiness meaning that relative income contributes in explaining happiness. Further, the introduction of relative income mitigates the strength of absolute income. Interestingly, the social comparison effect vanishes when only Eastern European countries are treated. In this case, reference income has a significantly positive effect on life satisfaction showing some evidence for the 'tunnel effect'.

31 **E**ducation has been divided into five different categories (less than 10, 10, 11, 12, and 12 or more years of schooling), age into five brackets (younger than 25, 25-34, 35-44, 45-65, and 66 or older) and regions into two areas (West and East Germany). All together, there are 50 different reference groups. (Ferrer-i-Carbonell, 2005, p. 1005)

32 **C**aporale et al. (2009, p. 46) defined the reference group in an other setting according to Ferrer-i-Carbonell (2005). However, the results remained largely unaffected.

4.1.2 Empirical Evidence for the 'Tunnel Effect'

The 'tunnel effect' was firstly proposed by Hirschman and Rothschild (1973), who describe the effect as follows:

> *"An individual's welfare depends on his present state of contentment (or, as a proxy, income), as well as on his expected future contentment (or income). Suppose that an individual has very little information about his future income, but at some point a few of his relatives, neighbors, or acquaintances improve their economic or social position. Now he has something to go on: expecting that his turn will come in due course, he will draw gratification from the advances of others – for a while." (pp. 545-546)*

Hence, Hirschman and Rothschild (1973) argue that – in particular in the context of economic development in combination with rapid growth and resulting inequality – a higher reference income may indicate better own future prospects meaning that a higher reference income is only perceived as a temporary deprivation (FitzRoy et al., 2013, p. 2). Then, the advances of others offer a valuable information about one's potential future income, which improve individual utility more than the social comparison effect, due to enviousness, will reduce it.
In line with this idea, Senik (2008, p. 496) argues that the tunnel effect may in particular occur in more mobile and uncertain environments, since the informational value of reference income is higher there. Defining the relevant reference income as the typical income of all the people who share the same productive characteristics, Senik (2008) finds evidence for the tunnel effect in European post-transition countries[33] and in the US (a higher reference income increases reported happiness), whereas reference income has in contrast a negative effect on reported happiness in 'old' European countries[34] showing that Europe is divided into different attitudes towards income distribution (Senik, 2008, p. 510). The fact that Senik (2008) finds a positive effect of comparison income in the US and in Eastern European countries needs to be treated critically, in particular since – as shown above – Layard et al. (2009) and Luttmer (2005) find contradictory results for the US. Although the East European results found by Senik (2008) are in line with the results – also shown above – provided by Caporale et al. (2009), it is also worth to mention the results of Drichoutis et al. (2010), who find no relation

33 **P**ost-transition countries considered are Russia, Hungary, Poland and the Baltic countries.
34 **O**ld European countries considered are the UK, Germany, Denmark, Netherlands, Belgium, Luxembourg, France, Ireland, Italy, Greece, Spain, Portugal, Austria and Finland.

between reported happiness and relative income in the East European transition countries applying partly different specifications regarding data management, variables used and econometric estimation issues than Caporale et al. (2009) (Drichoutis et al., 2010, p. 486).

Using the British Household Panel (BHPS) as well as the German Socio-Economic Panel (GSOEP), FitzRoy et al. (2013) find some evidence for the tunnel effect for younger respondents since the results show positive effects of comparison income on happiness for the people who are younger than 45 years and negative effects for those who are are older than 45 years in West Germany and the UK when sub-samples are applied[35]. The authors argue that the results are in line with the idea that younger people are more mobile and are more likely to see success of one's peers as an indicator for own future prospects than older, less flexible people do (FitzRoy et al., 2013, p. 2). However, the differences in the results may be driven by methodological differences. Instead of controlling for the usual age and age square control, age dummies for a 10 year period are applied. Furthermore, the reference income is also defined slightly different since it contains not only gender and the attainment of a similar education level but also dynamic 10-year-age intervals covering the idea that an individual compares mostly with people, which are in range of three years younger up to six years older than the individual (FitzRoy et al., 2013, p. 8).

When the reference group is defined as the average income of other people in the local residential cluster, Kingdon and Knight (2007) also report that comparison income has a positive impact on reported happiness in South Africa, which may be explained by fellow-feeling and the sense of community of the inhabitants.[36]

Lastly, using data from an extensive household survey, Akay and Martinsson (2011) find no relation between relative income and reported happiness in rural areas of northern Ethiopia. Age, size of land holdings and geographical area define hereby the reference group basically following Ferrer-i-Carbonell (2005). An explanation for the insignificant role of relative income is given by the role of kinship relations, which is higher in northern rural Ethiopian communities than in the Western world. Alternatively, one could also argue that the social comparison effect and the tunnel effect may cancel each other out.

35 **T**he sample is split up into the two sub-samples over and under 45 years. In contrast to the results obtained in West Germany and the UK, there are no comparison effect in East Germany at all (independently of treating the full-sample or the sub-samples). In the full-sample, comparison income is also insignificant in West Germany (FitzRoy et al., 2013, p. 21)

36 **I**n contrast, when the reference group is defined on a broader spatial level or in accordance to race, Kingdon and Knight (2007, pp. 86-87) obtain the usual result that comparison income influences reported happiness negatively.

4.1.3 Derived Empirical Regularities

To sum up, there is a wide range of literature dealing with relative income and happiness. Most studies find that relative income matters for happiness, whereby the effect on reported happiness is found to be mostly negative (McBride, 2001; Blanchflower & Oswald, 2004; Luttmer, 2005; Layard et al., 2009; Graham & Felton, 2006; Knight et al., 2009; Oshio et al., 2010; Kuegler, 2009; Ferrer-i-Carbonell, 2005; Caporale et al., 2009). However, other studies also report a positive effect on reported happiness arguing that income of the reference group offers information about future income or can be interpreted as the wealth of a particular community (Senik, 2008; Caporale et al., 2009; FitzRoy et al., 2013; Kingdon & Knight, 2007; Akay & Martinsson, 2011). All these findings can be summarized to the following empirical regularities:

- Relative income matters for explaining differences in happiness.
- Relative income (or more precise the income of the reference group) may impact on reported happiness positively or negatively, depending on which of the two opposing effects, *social comparison effect* or *tunnel effect*, dominate.
- If both the social comparison and the tunnel effect are equal, the net effect is zero. (Drichoutis et al., 2010; Akay & Martinsson, 2011)
- The tunnel effect seems to be stronger in mobile and uncertain environments (Senik, 2008; Caporale et al., 2009).
- Younger respondents are more likely to interpret reference income as an informational value about their future income prospects (tunnel effect). (FitzRoy et al., 2013)
- Comparisons are asymmetric (mainly upward).[37] (Blanchflower & Oswald, 2004; Knight et al., 2009; Ferrer-i-Carbonell, 2005)

Since these empirical regularities are based on the literature overview provided above, the list is not necessarily complete and rather shows a selection. Furthermore, relative income is not the only variable which captures negative or positive effects of comparisons on individual's happiness. For example, Ferrer-i-Carbonell (2012, p. 44) and Clark and Senik (2010, p. 585) refer to the finding that people who compare most are the least happy (which is however

37 In other words, the intensity of income comparisons decreases as income increases, i.e. richer people compare on average less. (Ferrer-i-Carbonell, 2012, p.44)

correlated with relative income, since rich people compare less than poor people). In addition, the degree of comparisons may not only depend on the income situation, but also on the employment situation. Self-employed compare their income significantly less than employees do[38] (Clark & Senik, 2010, p. 581).

The empirical regularities of relative income also contribute to explain the Easterlin Paradox, which states that there is no clear uptrend in happiness over time although real GDP per capita has risen in most countries of the world (Easterlin, 1997; Easterlin, 1995). Hence, to go one step ahead, the empirical regularities found need to be analyzed in a more formal and theoretical context.

4.2 Theoretical Considerations

4.2.1 Modeling of Utility Functions

The empirical literature shows that relative income matters. To broaden the view, people may not only compare their income situation with the income of the reference group (social comparison effect or tunnel effect) but also with the own past (adaption or habituation) (Clark et al., 2008, p. 99). Generally, both ideas can be formalized by the following generalized utility function,

[1] $$U_{it} = U\left(u_1(Y_{it}), u_2(Y_{it} / Y_{it}^*), u_3(Z_{it})\right)$$

where the utility U_{it} (approximated by reported happiness) of an individual i at point t is the result of three sub-utility functions containing absolute income Y_{it}, relative income Y_{it} / Y_{it}^* (with Y_{it}^* as average income of the reference group or comparison income) and a vector of other socio-economic and demographic variables Z_{it} (Clark et al., 2008, pp. 99-100). If a Cobb-Douglas utility function is assumed, the equation above can be expressed as follows,

[2] $$U_{it} = \beta_1 \ln(y_{it}) + \beta_2 \ln(y_{it} / y_{it}^*) + Z_{it}^{`} \gamma$$

where income y_{it} and as well as comparison income y_{it} / y_{it}^* is expressed in logarithmic terms to obtain a linear relation. The coefficients β_1, β_2 as well as the the coefficient vector γ then give information about the relation between each variable and utility (reported happiness). To

38 **T**his relation may also be influenced by relative income, since self-employed are more likely to earn a relatively higher income than employees.

obtain an econometrically correct relation, the equation is extended by a constant α and an error term η. In addition, since comparison income y_{it} / y_{it}^* is expressed in log terms, the equation can be rewritten as follows (Clark et al., 2008, p. 100; Clark & Senik, 2010, p. 577):

[3] $$U_t = \alpha + \beta_1 \ln(y_{it}) + \beta_2 (\ln y_{it} - \ln y_{it}^*) + Z_{it}^{`} \gamma + \eta$$

However, the utility function shown here has some restrictions. First, it is assumed that the variable income as well as comparison income contribute most when explaining utility (reported happiness). However, it is questionable, if – instead of income – rather consumption is the variable needed to explain reported happiness best. Of course, the underlying idea is that income is a good proxy for consumption and can be applied with no or only little doubt. For example, Clark et al. (2008, p. 100) observe that many studies assume that the sub-utility function $u(Y_{it} / Y_{it}^*)$ equals $u(C_{it} / C_{it}^*)$, with C_{it}^* as the average consumption of the reference group.[39]

Second, it is often not clear what the reference group (or the comparison income) of people really is. In most studies, the reference group income y_{it}^* is just stated by the researcher and constructed on basis of the data-set or an other external source (Clark & Senik, 2010, p. 578). Further, reference income may be based on both an internal reference point, an external reference point or a combination of both (Clark et al., 2008, p. 100).

The internal reference point is associated with own past income or expected future income and can be, for example, modeled as a weighted average of past income streams,

[4] $$y_{it}^* = (y_{it-1})^{\alpha} (y_{it-2})^{\beta} (y_{it-3})^{\gamma} \quad with \;\; 0 < \alpha, \beta, \gamma < 1 \;;\; \alpha + \beta + \gamma = 1$$

where the internal reference income from individual i at point t is based on the past own income of the, for example, last three years (Clark et al., 2008, p. 104). Hence, this way of modeling captures the idea that people do hedonically adapt to own income changes as time is fading due to adjusting aspirations such that they converge back to some hedonic baseline level (this process is often termed as *hedonic treadmill*) (Clark et al., 2008, p. 104; Easterlin & Anglescu, 2009, p. 13).[40] To give some empirical support, the studies of Brickman et al.

39 **M**ore precisely, one could also assume that income impacts on consumption, which impacts on utility such that $u(C_{it}(Y_{it}) / C_{it}^*(Y_{it}^*))$.

40 **E**asterlin and Anglescu (2009, p. 13) refer to the problem that aspirations are much flexible downwards. Therefore, it has to questioned if equation [4] should be applied symmetrically for both increasing and decreasing income over time.

(1978, p. 917), who find that lottery winners are not significantly happier than a control group and achieve less pleasure from everyday events[41], and Di Tella et al. (2010, p. 834), who find that the impact of a current year increase in income loses 64 percent of its effect over the following four years when analyzing individual panel data from about 8000 individuals over the period 1984 to 2000 in Germany, are in line with the idea to model the internal reference point as an weighted average of past income streams such that the income effect vanishes over time.[42]

On the other hand, the external reference point may be defined – as also sketched in the empirical literature – according to demographic groups (family, ethnicity, race), other workers at the pace of employment or people living in the same region or country. In this case, y_{it}^* is modeled mostly as the average income of the group people compare with,

[6] $$y_{it}^* = \frac{\sum_{j=1}^{N} y_{jt}}{N}$$

where the reference income y_{it}^* for the treated people i is the sum of the income y_{jt} of all people j in the reference group at point t divided by the total number of people N in the reference group.

Thus, the difficulty is not the calculation but rather the definition of the actual reference group, which will be discussed in greater depth in chapter 5.

4.2.2 A Contribution in Explaining the Easterlin-Paradox?

As there is evidence for relative income, it is of particular interest if relative income does contribute to explain the Easterlin-Paradox. Repeatedly, the Easterlin Paradox states that there is a weak relation between happiness and income in cross-country analysis, but a relation between income and happiness within countries. In the time dimension, income and happiness are only related in the short run.

To incorporate both the weak relation of happiness in cross-country studies and the stronger relation within countries, Clark et al. (2008, p. 100) suggest – assuming that income is the

41 More detailed, it is analyzed if 22 lottery winners are happier than a control group of 22 people. Although the lottery winner group had a huge increase in their income, they do not feel significantly happier, rather they lost pleasure in mundane events. (Brickman et al., 1987, p. 921)

42 Clark et al. (2008, pp. 109-111) provide a more extensive overview about happiness and income adaption in the empirical literature.

only variable different across countries and that reference income is the average country income – the following utility function,

[7] $$U_i = \beta_1 \frac{y_i}{y_i + A} + \beta_2 \ln\left(\frac{y_i}{y_i^*}\right)$$

where utility U_i (reported happiness) of an individual i in a specific country depends on the absolute income of the individual y_i and a positive constant A[43] represented by the first term, which is increasing at diminishing rates in y_i since the first term's derivative with respect to y_i is positive and the second derivative is negative such that:

[8] $$\frac{\partial U_i}{\partial y_i} = \beta_1 \frac{A}{(y_1 + A)^2} > 0 \quad with \;\; A, \beta_1 > 0$$

[9] $$\frac{\partial^2 U_i}{\partial y_i^2} = -\beta_1 \frac{2A}{(y_1 + A)^3} \quad with \;\; A, \beta_1 > 0$$

According to the construction, the first term implies also that the additional effect of an increase in absolute income on happiness approaches zero as income goes to infinity since

[10] $$\lim_{y_i \to \infty} \frac{y_i}{y_i + A} = 1$$

and yields, therefore, different results as when the effect of absolute income on utility (reported happiness) is modeled simply as $\ln(y_i)$[44] (cf. equation [2]). (Clark, Frijters & Shields, 2008, p. 100)

The second term of equation [7] represents the impact of relative income differences on utility (reported happiness) within a country outlining that a higher reference income y_i^* will reduce individuals happiness; at least as β_2 is assumed to be positive, which is questionable according to some empirical results found, for example, in Eastern Europe (Caporale et al., 2009).

The implications of the model are as follows. First, as general income rises over time, only the first term is affected. Since marginal utility from extra absolute income approaches zero, in

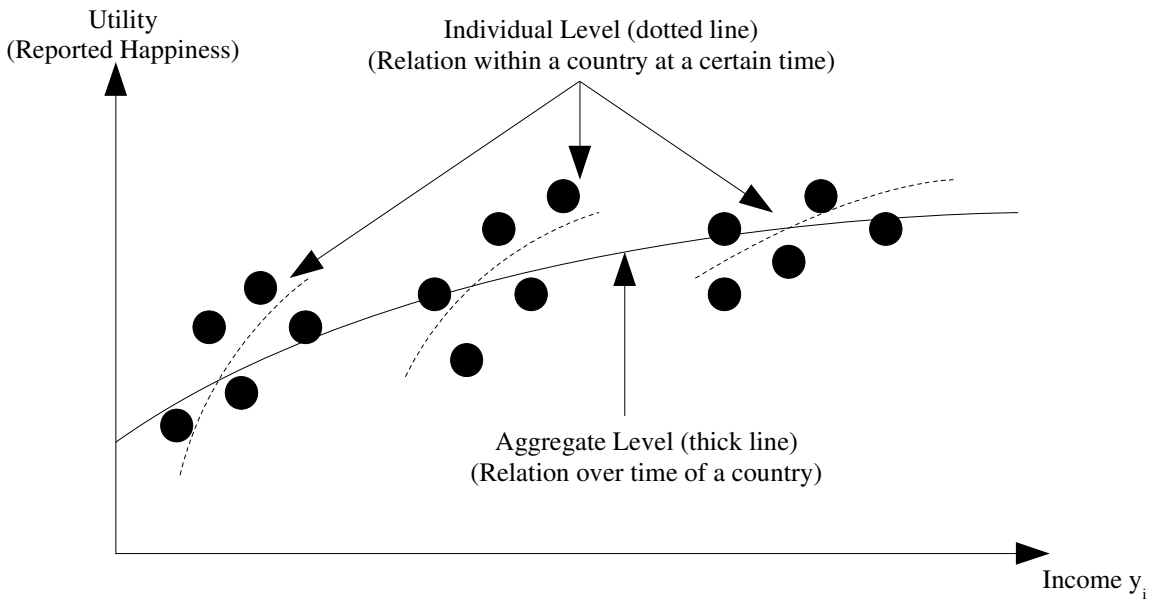
43 **T**he constant A ensures mathematically a concave relation between absolute income and happiness.

44 $\lim_{y_i \to \infty} (\ln y_i) = \infty$

particular rich countries benefit only little from a general rise in income (Clark et al., 2008, p. 101). Second, at a point in time, variations of utility (reported happiness) within a country are explained by relative income differences such that individuals with an income above country average are better off. Hence, the model predicts that the slope between income and happiness is steeper within countries at a point in time than over time, mainly caused by status benefits due to income differences within a country (Clark, Frijters & Shields, 2008, p. 100-101). Figure 3 represents the relation graphically,

where the thick line shows the less steep relation between aggregate income and utility (reported happiness) over time in a specific country and the thin line symbols relative income differences within a country at a certain point in time, which are steeper. All together, according to Clark et al. (2008, p. 101), the model, which incorporates relative income effects, contributes to explain the Easterlin-Paradox. As a country becomes rich, all people earn more income, which increases happiness on the aggregate level such that the country moves along the thick line. On the individual level, however, also income of the reference group rises, which reduces individuals happiness such that the net effect of a rise in overall income is small.

Figure 3: Relationship between Income, Relative Income and Happiness



Source: Own representation based on Clark et al. (2008, p. 101)

4.2.3 Concluding Remarks

Of course, the model structure presented above is only one possibility to deal with relative income effects. To give one further example, an other idea is that relative income matters not only within a country but also across countries such that people gain additional utility (reported happiness) when living in a relative successful country. To model this, again Clark et al. (2008, p. 102) suggest to extend the utility function represented by equation [2] by an additional term,

[11] $$U_{ijt} = \beta_1 \ln(y_{ijt}) + \beta_2 \ln(y_{ijt} / y^*_{jt}) + \beta_3 \ln(y^*_{jt} / y^*_t) + Z'_{ijt}\gamma$$

where U_{ijt} is the utility (reported happiness) of an individual i in country j at point in time t, y_{ijt} the income of individual i living in country j at point in time t, y_{jt}^* the average income in country j and y_t^* the average income of the set of countries treated. The third term reflects the idea that people, who are living in a country that is relatively richer than the average countries, obtain a benefit in individual utility perceived by just living in such a country. Again, if all countries grow over time with the same growth rate, the magnitude of the third term stays unchanged in every country. Hence, the implication is then that "countries are locked in an arms race over growth" meaning that a simultaneous economic growth does not contribute (or only little since there still is an impact due to the first term y_{ijt}) to aggregate happiness (Clark et al., p. 102).

To sum up, there are various ways of modeling utility-functions that incorporate relative income. The relevance of relative income is thereby not only empirically well-founded[45], but is also an important theoretical factor when explaining the Easterlin-Paradox. Of course, utility-functions can contain more than one relative income variable such that utility may be influenced by comparison income formed across and within countries. Beside the social comparison component, there exist also internal reference points such as own past income, which influences, at least in the short run, individual's utility (reported happiness) (Clark et al., 2008, p. 111).

So far, the calculation of the the comparison income was based on reference groups exogenously stated. Since the choice of the reference group is often just arbitrarily made, the following chapter which reference group specifications have been applied in the literature.

45 **C**lark et al. (2008, p. 111) argue that relative income may be at least twice as important as absolute income for individual's happiness.

5 Specifications of the Reference Group

Relative income or, in absolute terms, comparison income matter when explaining happiness. However, this leads to the question what individuals define to be their actual reference group or, in other words, to whom they compare themselves when judging their relative position or when searching information about potential future income prospects. In the literature, there are mainly two ways to deal with reference groups, namely as an exogenous variable, mostly stated by the researcher, or as an endogenous variable, defined by the respondent.

5.1 The Reference Group as Exogenous Variable

The choice of the correct reference group is of particular importance. Although there is a consensus about the calculation method (mean income or, in some articles, median income of the reference group) in the literature, the way of defining the individuals belonging to the reference group is from larger variety.

There are several ways of dividing reference group specifications into sub-groups[46]. Basically, the reference group can be separated into an internal and an external specification. The internal specification captures the idea that people may compare their current situation to their own past or to their anticipated future prospects. The external specification is based on comparisons an individual makes with other people. (Verme, 2013, pp. 10-11)

An econometric example to incorporate internal reference groups is provided by Knight et al. (2009, p. 645). On the one hand, they approximate an individual's own past by two dummy variables labeled 'Current living standards better than 5 years ago' and 'Current living standards worse than 5 years ago'. On the other hand, they approach the expectations about the future by asking the respondents if they 'Expect a big increase in income over next 5 years' or 'Expect a decrease in income over next 5 years'. Another example for an internal reference group is given by McBride (2001, p. 257). He incorporates 'parents standard of living' as explanatory variable.

However, most studies define the reference group to be external. The underlying idea is that people compare their income mostly with people, who have similar characteristics such as age, education, employment sector or area of living. The income of the reference group is usually calculated as the average income of all the people having similar characteristics as the

46 **V**erme (2013, pp. 10-11) reviews that the literature offers several possibilities of dividing reference points into sub-groups: Internal vs. external reference groups, parallel vs. longitudinal reference groups and alter vs. ego reference groups.

individual concerned (MacKerron, 2012, p. 720). Table 2 reviews some external reference group specifications.

Table 2: External Reference Group Specifications	
Author(s) Chronologically ordered	**Reference Group** Average Income of all Individuals
FitzRoy et al. (2013)	in the same education group (2 groups)
	inside the same age range (-3 up to + 6 years)
	with the same gender
Akay & Martinsson (2011)	inside the same age group (10 groups between 25 and 90)
	size of landholdings in hectares (ha) ({0}; (0;0.1]; (0.1;0.2]; (0.2;0.3]; (0.3;0.5]; (0.5;0.7]; (0.7;∞))
	living in the same area (rural areas of Northern Ethiopia)
Oshio et al. (2010)	within the same age group 20-29; 30-39; 40-49, 50-59; 60-69
	with the same gender
	with similar educational level (no formal qualification; lowest formal qualification; above lower formal qualification; higher secondary qualification completed; above higher secondary level; university degree completed)
Caporale et al. (2009)	inside the same age range (± 5 years)
Layard et al. (2009)	in the same education group (3 groups)
	in the same age range (± 5 years)
	with the same gender
Knight et al. (2009)	living inside or outside the same village (rural China)
Kuegler (2009)	Venezuelan siblings
Graham & Felton (2006)	living in the same country (Latin American countries)
Ferrer-i-Carbonell (2005)	with similar educational level (less than 10; 10; 11; 12; 12 and more years of schooling)
	inside the same age bracket (younger than 25; 25-34; 35-44;45-65; 66 and older)
	living in the same region (West and East Germany)
Luttmer (2005)	living in the same region (PUMA regions)

Blanchflower & Oswald (2004)	living in the same state (US states)
McBride (2001)	inside the same age range (± 5years)
Van de Stadt et al. (1985)	with the same educational level (five different education levels)
	within the same age bracket (less than 30, 30-39, 40-49, 50-65, over 65)
	with the same employment status (self-employed, employee, not employed)

According to table 2, external reference groups are mostly defined according to spatial or socio-demographic variables. Also interactions of both types are possible. An individual's reference group becomes more individualized the more socio-demographic or spatial variables are used to define the reference group. For example, Luttmer (2005) calculates solely the reference group according to the average income of the state such that every individual within the particular state faces the same comparison income. In contrast, Ferrer-i-Carbonell (2005) computes a more individualized reference income since he differentiates between educational level, age and region.

As the overwiew shows, there is a huge variety of literature that exogenously impose a specific reference group as relevant for relative income or, more generally, income comparisons (Clark & Senik, 2010, p. 573). In contrast to this general approach, there is also the possibility to ask the respondents of a survey about their reference group in order to endogenously obtain information on the reference group. For example, Knight et al. (2009) not just simply state a reference group but ask the respondents to report their actucal reference group.

Ideally, a data-set should contain a question, which directly asks the respondents about their comparison income. For example, Clark and Senik (2010) analyze the question “Whose income would you be most likely to compare your own with?”, which is included in the third wave of the ESS. The respondents had to choose between the answers 'Work colleagues', 'Family members', 'Friends', 'Others' and 'Don't compare'. Most respondents answered that they compare most to their 'Work colleagues' (36.3 %). 35.9 % answered that they 'Don't compare' to other people and 14.9 % compare mostly with 'Friends'. Interestingly, only 5.8 % of the respondents answered that they compare most likely with other 'Family members'. (Clark & Senik, 2010, p. 576)

The information gathered from such a survey can be used to model the exogenous reference

group more accurately. Since work colleagues (36.3 %) and friends (14.9 %) make up over 50 % of the responses, there is - as already suggested - some evidence that people compare mostly with people they are known to. On the other side, there may be huge characteristic differences between 'Work colleagues' and 'Friends' such that it should be allowed for heterogeneity when reference groups are modeled.

To sum up, there is a large variety of possible candidates for external reference groups. Empirical studies apply mostly a reference group containing people with similar socio-demographic characteristics (education, age, sex) or people living the same geographical area (state, country, village). Beside these, also the workplace (or the work colleagues) may be an important reference group. A reference point may also be the own family (e.g. siblings, spouse).

Lastly, taking into account that individuals may also have different identities in different contexts, they may also have more than one reference point, e.g. one reference point in the family, another reference point at their workplace (Kingdon & Knight, 2007, p. 70).

5.2 The Reference Group as Endogenous Variable

Beside the possibility to assume the reference group as exogenous, there is also some work on how individuals may form or choose their reference groups endogenously. However, to understand this process fully, it is necessary to have information on individuals goals, which can often only be provided by costly attitude surveys or from revealed preferences (migration between rich and poor neighborhoods) (Kingdon & Knight, 2007, p. 73). Nonetheless, the following chapter shortly sketches two ideas to model a reference group endogenously put forward by Falk and Knell (2004) and Koszegi and Rabin (2006).

Falk and Knell (2004) assume that people choose their optimal reference standard according to goals of self-improvement and self-enhancement. Self-improvement means that “people perform better and are more successful if they set themselves high goals or reference standards” (Falk & Knell, 2004, p. 421). Hence, they choose a reference group consisting of people who perform better than themselves in order to motivate and encourage themselves (upward comparison). In contrast, self-enhancement “refers to the fact that comparison with others who are inferior often makes us feel better” (Falk & Knell, 2004, p. 420). Hence, people may compare with others who are inferior or less fortunate to become more happy themselves (downward comparisons). Taking both effects together, Falk and Knell (2004) report that the optimally chosen reference group increases hierarchically in people's ability.

People with high ability choose their reference group first in order to self-improve themselves and, when their performance has increased, switch their reference group to self-enhance themselves to improve their life satisfaction through downward comparison.

Another idea to model the reference group (reference point) endogenously is put forward by Koszegi and Rabin (2006), who assume that the reference point is determined as rational expectations about outcomes. More detailed, “a person's reference point is her probabilistic beliefs about the relevant consumption outcome held between the time she first focused on the decision determining the outcome and shortly before consumption occurs” (Koszegi & Rabin, 2006, p. 1141).

6 Different Reference Group Specifications and Life Satisfaction

As the previous chapter has shown, there are a variety of possibilities to define the reference group. The following chapter aims at investigating different reference specifications and their impact on life satisfaction.[47] The question I want to answer is to what extent different specifications of reference groups lead to different results. I will also give some explanations, why different specifications may measure different effects.

To analyze this, I use the first three waves of the European Social Survey (ESS) as data basis. The method is to analyze systematically the impact of several reference group specifications on satisfaction. For the whole ESS sample, I use all reference specifications, which are based in any constellation on similar 'Education', 'Age', 'Gender' and 'Country'. For the German sub-sample, I do the same with specifications based on similar 'Education', 'Age', 'Gender' and 'Federal States' or 'East and West Germany'.

It may be important to note that the ESS data-set was already data basis of other studies analyzing the effect of reference income on life satisfaction. In particular, I refer to the studies performed by Caporale et al. (2009) and Drichoutis et al. (2010), on which this study is mainly based on.

Caporale et al. (2009), who used the first two waves of the ESS and defined the reference group according to the specification of McBride (2001), find clear evidence for the social comparison effect in the whole sample as well as for the sub-samples only containing young people (40 years or younger), old people (older than 40 years), well-educated, not-well-educated, Central European Countries, Scandinavia and Southern European Countries. In contrast, comparison income has a positive effect on life satisfaction in Eastern European countries indicating the tunnel effect (Caporale et al., 2009, p. 49).

Drichoutis et al. (2010) recalculated the results Caporale et al. (2009) obtained by applying a partly different methodology and modified reference group specifications. As a result, Drichoutis et al. (2010, p. 483) report that the coefficients of comparison income are partly different in sign, size and level of significance.

I follow in the most parts the methodology of Caporale et al. (2009) and Drichoutis et al. (2010). Basically, my modifications are that I use the first three waves of the ESS as data basis (instead of the first two waves), include new control variables in the regression (e.g.

47 The idea to test systematically the impact of the reference specification on life satisfaction is not new in the literature. For example, Akay and Martinsson (2011) found that different reference group specifications alter the impact of absolute and relative income – in particular the magnitude of the coefficients – on life satisfaction in rural areas of northern Ethiopia.

Religion and Perceived Safety) and test systematically for different reference specifications.
The remainder of this chapter is structured as follows. In sub-chapter 1, I describe shortly the ESS data basis and the choice of the variables. Methodological and econometric issues will be discussed in sub-chapter 2. The third sub-chapter deals in greater detail with the chosen reference group specifications. Finally, I present, summarize and discuss the results obtained in sub-chapter 4, where I also shortly sketch problems and shortcomings of the study.

6.1 Data Description and Choice of Variables

The first three waves (2002, 2004 and 2006) of the cross-sectional data of the European Social Survey (ESS) is the basis for the empiricial analysis. Within these three waves, the ESS covers 29 (mostly European) countries. Until now, there are six waves of the ESS published[48], which measure beliefs, behavioral patterns and attitudes of more than thirty nations. The survey has been funded by the European Commisson's Framework Programmes, by the European Science Foundation and by National funding councils in participating countries. A key aim of the ESS is to implement high standards in its methodology regarding the sampling of respondents, the equivalcence of translation and the questionaire.[49]
The ESS data provide a large variety of variables[50] useful for happiness research. To measure life satisfaction, two questions are of particular interest. The first questions asks “All things considered, how satisfied are you with your life as a whole nowadays?“. Possible answers range on a 11-point scale from 'extremely dissatisfied' (0) to 'extremely satisfied' (10). The second question asks “Taking all things together, how happy would you say you are?“, whereby the possible answers range again on a 11-point scale from 'extremely unhappy' (0) to 'extremely happy' (10).
As explanatory variables, the ESS offers several economic and socio-demographic variables. The total household net income of the respondent is measured ordinally in twelve income categories ranging from less than 40 Euro per week up to more than 2310 Euro per week.[51] As standard, the ESS provides information on gender and age of the respondents. Additionally,

48 **I** use only the first three waves of the ESS, since the measurement of the income variable was severely altered from the fouth wave on. Instead of concrete income intervalls, income was from the fouth wave on measured in ten deciles which vary across countries.
49 **A** more detailed description of the ESS methdology can be found at the homepage of the ESS. (http://www.europeansocialsurvey.org/methodology/)
50 **T**he variables I used are listed in Appendix A.
51 **M**ore precisely, answer categories of weekly total household net income are (in intervalls in €): [0,40); [40, 70); [70, 120); [120, 230); [230, 350); [350, 460); [460, 580); [580, 690); [690, 1150); [1150, 1730); [1730, 2310); [2130, ∞).

information is given on the family status ('Never married', 'Married', 'Separated', 'Divorced' or 'Widowed') including Children ('Children at home'), health (ranging from 'very good' health to 'very bad' health on a 5-point scale) and religion (belonging to a religion or denomination). Also information on the social activity ("How often socially meet with friends, relatives or colleagues?" with answer categories 'Never', 'Less than once a month', 'Once a month', 'Several times a month', 'Once a week', 'Several times a week' and 'Every day') and the perceived feeling of safety ("Feeling of safety of walking alone in local area after dark?" with answers 'Very Safe', 'Safe', 'Unsafe' and 'Very unsafe') will be used in the regression analysis. The highest level of education is separated into five categories ranging from completed primary education or less (ISCED 0-1) to tertiary education completed (ISCED 5-6).[52] To capture also geographical effects, also the variable asking for the domicile the respondents live will be considered (answer categories are 'Big city', 'Suburbs or outskirts of a big city', 'Town or small city', 'Village resident' and 'Countryside'). As proxy for employment status and activity, the information is used what respondents stated having done in the last seven days with answer possibilities 'Paid Work', 'Education', 'Unemployed', 'Permanently Disabled or Sick', 'Retired', 'Community or Civil Service' and 'Housekeeping', whereby this question allowed for several answers. Lastly, to capture also the long term effects of unemployment, the variables asking for any period of unemployment and work seeking 'lasted for more than 12 months' and 'within the last 5 years' are considered. (ESS Questionnaire, 2012)

Note that I choose most of the variables in accordance of the studies made by Caporale et al. (2009) and Drichoutis et al. (2010). Different to these studies, I expand the amount of variables being treated by 'Religion', 'Social activity', 'Perceived Feeling of Safety' as well as 'Employment Status and Activity'. Of course, the ESS data-set provides a lot of more variables, which I could theoretically choose as explanatory variable.

52 **I**SCED is the abbreveation for International Standard Classification of Education and serves to "facilitate comparisons of education statistics and indicators across countries on the basis of uniform and internationally agreed definitions" (UNESCO, 2014).

6.2 Methodology

6.2.1 Data Preparation[53]

In a first step, it was necessary to merge the first three waves of the ESS data-sets. The first wave (ESS1) contained originally 565 variables and 42359 observations, the second wave (ESS2) contained 603 variables and 47527 observations and the third wave (ESS3) contained 517 variables and 43000 observations. For the sake of clarity, I generated initially a sub-set for each of the three waves, which contained only the variables I needed for the further statistical analysis[54]. Based on the subset, I merged the three waves, whereby I needed to recode some variables of the third wave first.[55] In total, there were now 132896 observations.

In a next step, I deleted all observations, where at least one of the happiness, income or socio-demographic variables had a missing value or had entries like "Don't know", "Not applicable" or "Refusal". 82544 observations remained.

Thereafter, the remaining variables were recoded in values and labels[56]. Regarding the happiness variables, I relabeled the variable asking for life satisfaction to "SAT". The variable asking for happiness remained the original label "HAPPY".

Regarding the geographical variables, I generated dummy variables for each country. Similarly, I generated five dummy variables for the variable measuring the degree of urbanization ranging from living in "a big city" to living in a "farm or home in the countryside".

Treating the socio-economic variables, I had to face some difficulties. I recoded the variable for gender to a dummy-variable (0 for "female" and 1 for "male") and relabeled it to "MALE". The age of the respondent was given in a continuous form such that I could easily calculate a variable for age squared. Then, five dummy variables were generated for the educational level of the respondents ranging from "Less than lower secondary education" to "Completed tertiary education". The family status was assigned to five dummies with the characteristics "Never married", "Married", "Separated", "Divorced" and "Widowed". The dummy-variable "Children" was calculated stating if the respondents have at least one child at home. Furthermore, dummy variables were calculated for "Religion" (0 if not belonging to a particular religion, 1 if belonging to a particular religion), "Health" (1 if good or very good

53 **T**he data preparation process can also be follwed by the provided do-file at the hard disc.

54 **T**he variables selected are presented in the Appendix A.

55 **T**he variable 'agea' was rounded to obtain whole numbers. The variable 'martiala' obtained in wave three the first time also the status 'Civil Partnership', which were dropped. Also the variable outlining the year of the interview was adjusted to the first and the second wave.

56 **A**lso listed in the Appendix A.

health, 0 otherwise), "Social" (1 if the respondent meets colleagues, relatives or friends several times a week or every day, 0 otherwise, i.e. less than several times a week) and "Perceived Safety" (1 if the respondent feels safe or very safe when walking alone in the local area after dark, 0 otherwise). In addition, I added two dummies to capture the long term effects of unemployment. Here, the first dummy equals 1 if the respondent was unemployed in any period in the last 12 months, the second dummy equals 1 if the respondent was unemployed in any period in the last 5 years. Of course, I also generated dummies for the ESS round and the year of the interview to capture variety in time.

In a next step, I treated the absolute income variable. The monthly net income of the household was originally measured in twelve income categories ranging from "less than 40 € net income per week" to "more than 2310 € net income per week". Following Caporale et al. (2009), eleven dummy variables were constructed to be able to measure the impact of absolute household income on satisfaction, where the categories representing the two lowest income groups were merged to one category "less than 70 € net income per week". It is important to notice that the income variable represents the income of an household and not of an individual. Although the data-set offers some variables such as "Living with a partner", "Household size" and "Children living at home", which offered some possibilities to recalculate the household income to an individual income, I decided to work further with the household income. This had two reasons. First, it was not possible to assign individual income clearly to the respondent since individual income of other household members (partner, children or grandparents) remained unknown. Second, both Caporale et al. (2009) and Drichoutis et al. (2010) also worked with household income.

For the German sub-sample, I restricted the data-set to all people living in Germany. Based on this subset, I compiled dummies for each of the 16 federal states in Germany as well as a dummy for East and West Germany.

6.2.2 Estimation Procedure

Principally, there are different types of estimators dependent on which scale is assumed for the dependent variable "Satisfaction" or respectively "Happiness". If the dependent variable is assumed to be cardinally (meaning that the difference between 1 and 2 is the same as the difference between 5 and 6 for any individual), the OLS estimation method would be sufficient to calculate the coefficients for the model

[12] $$Sat_i = x_i\beta + \epsilon_i$$

where Sat_i is either “Satisfaction” or “Happiness”, x_i the vector of explanatory variables and ε_i the error term, which is expected to be 0 in mean value. This method is, however, mostly applied by psychologists and rather seldom by economists, although there are some studies by economists that use this method such as Gardner and Oswald (2001), Luttmer (2005), Knight et al. (2009), Clark and Senik (2010) or FitzRoy et al. (2013).

In contrast, economists usually assume that satisfaction answers are only ordinally comparable (the difference between satisfaction is unknown, but all individuals have the same interpretation of each possible answer) (Ferrer-i-Carbonell, 2004, p. 641). To deal with this assumption statistically correct, an ordered probit or an ordered logit model is necessary (the equation to estimate is principally the same as equation [12]). For example, economic studies that apply an ordered probit model are McBride (2001), Ferrer-i-Carbonell (2005), Caporale et al. (2009), Drichoutis et al. (2010), Akay and Martinsson (2011) and Kuegler (2009). Ordered logit models were used by Graham and Felton (2006) and Oshio et al. (2010).

Although the assumption that happiness is measured ordinally would exactly require an ordered logit or probit estimation, there is some evidence that OLS estimations lead to similar results. This is mainly reasoned by the fact that Ferrer-i-Carbonell and Frijters (2004) showed in a methodological paper that it is relatively unimportant to the results if cardinality or ordinality is assumed. Also Luttmer (2005, p. 980-981) and Kingdon and Knight (2007, p. 76) checked for both an ordered probit model and an OLS model and found no significant differences regarding the sign, magnitude and significance of the coefficients. In addition, Clark and Senik (2010) rely on the results of Ferrer-i-Carbonell and Frijters (2004) and perform an OLS regression, since the results are also more handy to interpret.

Exemplary, table 3 compares the regression results of an ordered probit model with the results of an OLS model including all socio-economic, geographical, educational and income variables. Reference income is excluded.

The results show that in the most cases both estimation procedures lead to the same sign and level of significance of the coefficients. However, there are also some exceptions. The dummy standing for 'Divorced' is insignificant when using a ordered probit model but significant at the 5%-level when applying OLS. Similar, the dummies for education are more likely to be significant when applying OLS. Another difference is the dummy for doing 'Paid Work', where OLS produces insignificant results, but the ordered probit model find a negative effect at the 5%-level.

Table 3: Ordered probit vs. OLS estiamtes	Ordered probit estimates			OLS estimates		
Dependent Variable: Satisfaction	(1)			(2)		
	Coeff.	Wald-statistics	p-value	Coeff.	t-statistics	p-value
Socio-Demographic Variables						
Male	-0.107***	182.917	0.000	-0.191***	-12.897	0.000
Age	-0.026***	326.075	0.000	-0.49***	-17.990	0.000
Age^2	0.0003***	375.816	0.000	0.001***	19.280	0.000
Married	0.224***	375.816	0.000	0.388***	17.283	0.000
Separated	-0.206***	45.952	0.000	-0.473***	-8.229	0.000
Divorced	-0.013	0.599	0.439	-0.065**	-2.082	0.037
Widowed[a]	-0.038**	4.421	0.036	-0.099***	-2.895	0.004
Children	-0.051***	31.878	0.000	-0.091***	-5.348	0.000
Good health	0.459***	2719.681	0.000	0.870***	52.799	0.000
Religion	0.086***	109.652	0.000	0.162***	10.517	0.000
Social	0.188***	558.233	0.000	0.346***	23.152	0.000
Perceived Safety	0.153***	275.682	0.000	0.343***	19.760	0.000
Geographical Variables						
Big city	-0.123***	47.692	0.000	-0.173***	-5.213	0.000
Suburbs or outskirts of big city	-0.127***	51.136	0.000	-0.195***	-5.877	0.000
Town or small city	-0.116***	48.938	0.000	-0.180***	-5.834	0.000
Village resident[b]	-0.077***	21.693	0.000	-0.108***	-3.486	0.000
Education						
Low secondary	-0.003	0.039	0.843	0.029	1.106	0.269
Upper secondary	-0.004	0.072	0.788	0.061**	2.386	0.017
Post secondary	0.071***	6.871	0.009	0.217***	4.256	0.000
Tertiary[c]	0.014	0.953	0.329	0.124***	4.493	0.000
Activity (in the last seven days)						
Paid Work	-0.026**	4.124	0.042	-0.009	-0.388	0.698
Education	0.073***	18.135	0.000	0.182***	5.669	0.000
Unemployed	-0.279***	196.895	0.000	-0.604***	-16.048	0.000
Permanently Disabled or Sick	-0.256***	133.156	0.000	-0.579***	-13.784	0.000
Retired	0.075***	21.479	0.000	0.133***	4.372	0.000
Community or Civil Service	0.077	1.301	0.254	0.132	1.042	0.298
Housekeeping	0.037***	14.621	0.000	0.061***	3.379	0.001
Any Period of Unemployment and Work Seeking						
Lasted for more than 12 months	-0.126***	87.083	0.000	-0.293***	-11.464	0.000
Within the last 5 years	-0.158***	132.869	0.000	-0.321***	-12.449	0.000
Income						
70-120€	0.168***	84.864	0.000	0.425***	12.275	0.000
120-230€	0.252***	206.772	0.000	0.622***	18.766	0.000
230-350€	0.335***	321.916	0.000	0.791***	22.412	0.000
350-460€	0.391***	385.856	0.000	0.907***	24.120	0.000
460-580€	0.430***	427.895	0.000	0.979***	24.973	0.000
580-690€	0.466***	473.961	0.000	1.047***	25.980	0.000
690-1150€	0.521***	630.303	0.000	1.132***	28.974	0.000
1150-1730€	0.557***	546.825	0.000	1.183***	26.463	0.000
1730-2310€	0.547***	293.322	0.000	1.168***	19.532	0.000
>2310€[d]	0.658***	312.392	0.000	1.299***	18.737	0.000
Year/ESS round/country dummies	Included			Included		
Pseudo R^2 (Cox and Snell) / R^2	0.240			0.259		
Number of obersations	82544			82544		

Excluded categories: [a] Never married [b] Countryside [c] Primary or less [d] <70€

* at 10%-level significant ** at 5%-level significant *** at 1%-level significant

Table 4: Satisfaction vs. Happiness	Dependent: Satisfaction			Dependent: Happy		
Ordered probit estimates	(1)			(2)		
	Coeff.	Wald-statistics	p-value	Coeff.	Wald-statistics	p-value
Socio-Demographic Variables						
Male	-0.107***	182.917	0.000	-0.105***	176.355	0.000
Age	-0.026***	326.075	0.000	-0.030***	426.111	0.000
Age^2	0.0003***	375.816	0.000	0.0003***	414.536	0.000
Married	0.224***	375.816	0.000	0.335***	783.247	0.000
Separated	-0.206***	45.952	0.000	-0.228***	56.459	0.000
Divorced	-0.013	0.599	0.439	-0.002	0.010	0.920
Widowed[a]	-0.038**	4.421	0.036	-0.131***	52.267	0.000
Children	-0.051***	31.878	0.000	-0.014	2.526	0.112
Good health	0.459***	2719.681	0.000	0.458***	2704.015	0.000
Religion	0.086***	109.652	0.000	0.071***	75.053	0.000
Social	0.188***	558.233	0.000	0.223***	782.981	0.000
Perceived Safety	0.153***	275.682	0.000	0.127***	191.511	0.000
Geographical Variables						
Big city	-0.123***	47.692	0.000	-0.100***	31.420	0.000
Suburbs or outskirts of big city	-0.127***	51.136	0.000	-0.105***	34.958	0.000
Town or small city	-0.116***	48.938	0.000	-0.088***	28.351	0.000
Village resident[b]	-0.077***	21.693	0.000	-0.069***	17.470	0.000
Education						
Low secondary	-0.003	0.039	0.843	-0.017	1.453	0.228
Upper secondary	-0.004	0.072	0.788	-0.019	1.931	0.165
Post secondary	0.071***	6.871	0.009	0.036	1.773	0.183
Tertiary[c]	0.014	0.953	0.329	-0.018	1.532	0.216
Activity (in the last seven days)						
Paid Work	-0.026**	4.124	0.042	-0.016	1.515	0.218
Education	0.073***	18.135	0.000	0.045***	6.795	0.009
Unemployed	-0.279***	196.895	0.000	-0.193***	93.330	0.000
Permanently Disabled or Sick	-0.256***	133.156	0.000	-0.157***	49.751	0.000
Retired	0.075***	21.479	0.000	0.061***	14.359	0.000
Community or Civil Service	0.077	1.301	0.254	0.147**	4.668	0.031
Housekeeping	0.037***	14.621	0.000	0.047***	23.395	0.000
Any Period of Unemployment and Work Seeking						
Lasted for more than 12 months	-0.126***	87.083	0.000	-0.293***	-11.464	0.000
Within the last 5 years	-0.158***	132.869	0.000	-0.321***	-12.449	0.000
Income						
70-120€	0.168***	84.864	0.000	0.158***	74.562	0.000
120-230€	0.252***	206.772	0.000	0.231***	174.189	0.000
230-350€	0.335***	321.916	0.000	0.303***	263.251	0.000
350-460€	0.391***	385.856	0.000	0.346***	302.491	0.000
460-580€	0.430***	427.895	0.000	0.381***	335.853	0.000
580-690€	0.466***	473.961	0.000	0.409***	364.111	0.000
690-1150€	0.521***	630.303	0.000	0.418***	405.961	0.000
1150-1730€	0.557***	546.825	0.000	0.469***	387.119	0.000
1730-2310€	0.547***	293.322	0.000	0.424***	176.018	0.000
>2310€[d]	0.658***	312.392	0.000	0.506***	185.219	0.000
Year/ESS round/country dummies	Included			Included		
Pseudo R^2 (Cox and Snell)	0.240			0.203		
Number of obersations	82544			82544		

Excluded categories: [a] Never married [b] Countryside [c] Primary or less [d] <70€

* at 10%-level significant ** at 5%-level significant *** at 1%-level significant

As the choice of the estimation procedure leads to small differences in the results, the following analysis sticks to ordered probit estimations and not to the more easily interpretable OLS estimations. This decision is also in line with the idea that the dependent variable is only ordinally and not cardinally interpretable.

Another problem to think about is the dependent variable. The ESS data-set offers two different variables, which may be useful to measure life satisfaction. The first variable is 'Satisfaction', measured by the question "All things considered, how satisfied are you with your life as a whole nowadays?", the second variable is 'Happy', measured by the question "Taking all things together, how happy would you say you are?".

To check if both variables lead to the same results, I estimated two ordered probit models with 'Satisfaction' as dependent variable of the first model and 'Happy' as dependent of the second model. Again excluding the reference income, both models contain the same explanatory variables.

The results, shown in table 4, show several differences. First, the overall model fit is better with 'Satisfaction' as the dependent variable, since the Pseudo-R^2 (Cox and Snell) has value 0.240, whereas the value of the Pseudo-R^2 (Cox and Snell) is 0.204 with 'Happy' as dependent variable. Second, there are also differences in the coefficients regarding significance. A first example is that to be 'Widowed' reduces 'Happiness' (-0.131^{***}) statistically significiant at the 1%-level, but reduces 'Satisfaction' (-0.038^{**}) only statistically significant at the 5%-level. Another example is that people with 'Children' are significantly less satisfied (-0.051^{***}) but not significantly less happy (-0.014) than people without children at home. A last example is that people doing 'Community or Civil Service' are not significantly more satisfied (0.077) than people who are not doing 'Community or Civil Service', but seem to be significantly more happy (0.147^{***}) than people who are not doing 'Community or Civil Service'.

The other coefficients are roughly the same. Hence, it could be argued that 'Satisfaction' and 'Happiness' measure the same underlying dimension. However, there are several reason against this argument. First, the correlation coefficient (Spearman) is 0.708. If 'Satisfaction' and 'Happiness' would measure the same dimension, I would expect a correlation cofficient of 1 or at least very close to 1. Second, summary statistics – shown in Appendix A – show that average satisfaction has value 7.06 and average happiness has value 7.35. To compare both mean values, I performed a two sample t-test and found that average happiness is significantly higher than average satisfaction at levels of significance. Hence, people systematically report higher happiness. Lastly, the model fit (Pseudo-R^2 with 'Happiness' as dependent variable is 0.203; Pseudo-R^2 with 'Satisfaction' as dependent variable is 0.240) as well as some important

variables (Children, Widowed) show clear differences. Therefore, I assume that happiness and satisfaction cannot be used synonymously. The argument is that “life satisfaction refers to cognitive states of consciousness, whereas happiness is emotional and mainly concerns intimate matters of life“ (Caporale et al., 2005, p. 43). Because of this conceptual difference between 'Satisfaction' and 'Happiness', I decided to use 'Satisfaction' as dependent variable for the upcoming analysis regarding the specific role of reference groups.

6.2.3 Further Econometric Issues

Before estimating the impact of the reference income on satisfaction, it is methodologically necessary to deal with some further econometric issues such as omitted variable bias, multicollinearity, non-linearity, concavity and convexity of the utility function as well as possible endogeneity.

Omitted variables may have severe effects on the estimation results of a model. A first point is that, all across the literature, happiness models can only explain little of the whole variation in happiness shown by typically low values of R^2 or pseudo-R^2 (Verme, 2013, p. 17). Hence, the introduction of omitted variables as further control variables may improve the explanatory power of the model. Exemplary, Kuegler (2009, p. 4) provides a set of control variables, which a happiness regression should contain such as relative and absolute income, employment, health, education, experienced crime and social and political participation. Beside the set of micro-level control variables, macro-economic control variables should also be applied when treating individuals from different countries in different point in times. To give an example, there is evidence that income inequality (Alesina et al., 2004) as well as inflation and general unemployment (Di Tella et al., 2001) impact on the individual level of satisfaction. In the empirical study performed here, these macro-economic effects are considered by introducing year, ESS wave and country dummies. Another point is that omitted variables may - as far as they are a determinant of the dependent variable and correlated with at least one explanatory variable - alter the size, the magnitude and the level of significance of a variable already being introduced (omitted variable bias). Since the study here controls for most of the control variables suggested by the literature, omitted variables bias is assumed to be of minor relevance.

Another problem in life satisfaction regressions is multicollinearity, where two or more explanatory variables are highly correlated such that they are linear dependent or closely to. In happiness equations, this problem mainly arises when constructed variables are introduced on

the right-hand-side on the happiness equation such as reference income, relative income or income inequality (Verme, 2013, p. 16). For example, when the reference income is constructed based on the average income of all people with the same gender, there is linear dependence between the gender dummy and the reference income. In this case, the introduction of the reference income in the happiness equation does not improve the explanatory power of the model. In this case, statistical programs like SPSS exclude the reference income automatically. Similar problems arise also when the reference income is constructed based on several variables such as same age, gender and education. In this case, the introduction of the reference income in happiness equations typically alter size and level of significance of age, gender and education variables.[57]

Further, also non-linearity of the utility function may be an issue. For example, the relation between absolute income and satisfaction theoretically follows a concave relationship. The usual way to overcome this obstacle is to take the natural log of the income variable to obtain a linear relationship between log income and satisfaction. However, since the ESS data-set offers a categorical income variable (and not a continuous income variable), it is not necessary to take the logarithm. Instead, the regression includes a dummy variable for each income band, which accounts for a possible non-linear relation between income and happiness (at least across income bands). Another typical example for a non-linearity is the relation between satisfaction and age, where most studies find a U-shaped relation (Kuegler, 2009, p. 4). To take this into account, the right-hand-side of the equation contains not only age but also age squared.

Lastly, also endogeneity may be an issue. For example, it is mostly assumed that a higher level of absolute income increases peoples satisfaction. On the other hand, one could argue that people who are more happy will be more successful in their job performance and, therefore, will earn more money. Then, the relation would run from happiness to income. Since this problem is difficult to address (one should have information about person specific characteristics like genes, motivation or general life attitude) or to instrument by an instrument variable, I will follow the literature and assume that income influences happiness. Hence, I will not address endogeneity in greater depth.

57 **T**his issues will be discussed in greater detail when presenting the regression results (chapter 6.4).

6.3 Relative Income and Reference Group Specifications

Before analyzing the impact of relative income on satisfaction, it needs to be specified, in which way relative income should be incorporated in the happiness equation and what types of reference groups shall be tested.

Regarding the specification of relative income, the ESS data do not allow to apply the ratio of absolute over average income of the reference group, since income is not offered in continuous form. That makes it also impossible to calculate the effect of the distance between actual income and the average income of the reference income precisely. Therefore, I decided to plug comparison income in the satisfaction equation without relating it to absolute income relatively or absolutely. This specification leads then to the interpretation that a negative sign of the comparison income means that a higher comparison income lowers an individual's happiness, which would indicate a *social comparison effect*. In contrast, a positive sign of the comparison income would mean that a higher comparison income increases an individual's happiness indicating some evidence for *the tunnel effect*.

The next step is to define the reference group specifications. Since the literature offered a large variety of different specifications, the question is which specification of the reference group fits best in explaining satisfaction. To do so, I decided to define the reference group based on the variables mostly used in the literature[58]: 'Age', 'Gender' and 'Education' as socio-demographic variables and 'Country' (or 'East/West' or 'Federal States' respectively at the German sub-sample) as spatial variable. For example, when using 'Country' and 'Gender' as break variable[59], I calculated comparison income as the average income of all individuals living in the same country and being from same gender as the individual treated. For the whole sample (whole ESS sample), 15 different specifications for comparison income could theoretically be calculated based on the four break variables ('Age', 'Gender', 'Education', 'Country'). For the German Sub-Sample, the amount of different specifications for the comparison income is little higher (23), since I check for either 'East/West' or 'Federal States' as geographical break variable. More concrete, all theoretically possible specifications are listed in table 5.

58 **F**or more details see chapter 5.1.

59 **T**he break variable tells, which respondents need to be considered when aggregating income.

Table 5: Reference Group Specifications

Whole Sample	German Sub-Sample	
Age	Age	
Gender	Gender	
Education	Education	
Country	East/West	Federal States
Education, Age	Education, Age	
Education, Gender	Education, Gender	
Education, Country	Education, East/West	Education, Federal States
Age, Gender	Age, Gender	
Age, Country	Age, East/West	Age, Federal States
Gender, Country	Gender, East/West	Gender, Federal States
Education, Age, Gender	Education, Age, Gender	
Education, Age, Country	Education, Age, East/West	Education, Age, Federal States
Education, Gender, Country	Education, Gender, East/West	Education, Gender, Federal States
Age, Gender, Country	Age, Gender, East/West	Age, Gender, Federal States
Education, Age, Gender, Country	Education, Age, Gender, East/West	Education, Age, Gender, Federal States

Before calculating the comparison income based on the different reference group specifications, some further obstacles had to be faced, namely how to deal with design and population weights the ESS data-set offered and how to define age as a break variable.

Since the reference income is calculated as the average income of all respondents with the same characteristics based on the specification of the reference group, reference income needs to be treated as an aggregate variable. Hence, the question was if it is necessary to apply design weights and population weights which the ESS data-set offered. Design weights are mainly contributing in overcoming biases since not all individuals in the population older than 15 years had the same chance of selection; and population weights account for imbalances caused by the fact that most countries taking part in the ESS have a similar sample size independent on how large their population actually is (ESS Weight Instructions, 2013). Precisely, it would be necessary to put both population and design weights on if neither 'Country' nor 'Age' is used as break variable. If only 'Age' is part of the comparison income specification, only the population weights need to be applied. Similarly, if only the variable 'Country' is part of the comparison income specification, only design weights need to be applied. If both variables 'Country' and 'Age' are part of the reference group specification, no weights need to be applied. However, since already roughly 38% of the original observations were deleted, it cannot be ensured that both the population and the design weights are still

accurate. Therefore, I decided to report both the results without weights applied when compiling the comparison income and the results with weights applied.[60]

Another issue was to define 'Age' as a break variable. The literature provides a variety of different suggestions how the 'Age' variable should be used to set a frame for the reference group. McBride (2001) applies the idea that people compare mostly with people which are in range of five years younger to five years older than the respondent. Ferrer-i-Carbonell (2005) assumes that people compare to others inside the same age bracket (10-year intervals). Similarly, Oshio et al. (2010) assume also that people compare to others inside the same age brackets (10-year intervals) but set different borders of the brackets than Ferrer-i-Carbonell (2005).

Based on this observation, the question was to what extent different specifications of 'Age' as a break variable alter the results. To test for this, I used the whole sample to check for the statistical relevance of the different specifications. In addition to the specifications presented above, I checked also for another specification, where age brackets were defined on 5-year intervals.[61] To decide which age specification to choose, I calculated the comparison income for every specification and tested for its statistical significance when incorporating it in the happiness regression.

To calculate the comparison income, I used the midpoints of the reported income bands to generate a continuous income variable[62] following the approach of Clark and Senik (2010, p. 580), Caporale et al. (2009) and Drichoutis et al. (2010, p. 481), who also work with the ESS data-set. Then, I compiled the reference income (average net household income per week) with respect to each specification of 'Age' as a break variable. According to Drichoutis et al. (2010), the reference income specification was finally scaled down by a factor of 100 to obtain more handy coefficients. The results of the comparison income of each 'Age' specification are presented in table 6.

Irrespectively of applying weights or not applying weights when calculating the reference income, comparison income enters with a negative coefficient significant at the 1%-level. According to the Wald-statistics, age brackets based on 5 year intervals as well as the age range of ± 5 years seem to be most significant, although the pseudo-R^2 does not improve visibly. Since the calculation of comparison income with age brackets as break variable was easier with SPSS and there are no differences in significance between 5 year intervals and the

60 **A**n idea to overcome this shortcoming is to readjust or to recalculate the weights to the prepared sample.

61 **T**he brackets are [1;19], [20;24], [25;29], [30;34], [35;39], [40;44], [45;49], [50;54], [55;59], [60;64], [65;75], [76;100].

62 **F**or the highest income category (2310 Euro and more), a value of 4000 Euro was assumed as midpoint of the income band.

range of ± 5 years, I decided to work with 'Age' as a break variable defined as all individuals being in the same age bracket (5-year intervals).

Table 6: Reference Group (Age)	Dependent: Satisfaction				Dependent: Satisfaction			
Ordered probit estimates – Whole Sample	(1) –Unweighted				(2) – Weighted (Population)			
	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)
Reference Income Specification (Age): Inside....								
Age Bracket [10 year intervals] (Ferrer-i-Carbonell)	-0.030***	19.688	0.000	0.240	-0.040***	23.118	0.000	0.240
Age Bracket [10 year intervals] (Oshio et al.)	-0.049***	41.972	0.000	0.240	-0.061***	43.916	0.000	0.240
Age Bracket [5 year intervals]	**-0.059*** **	**58.372**	**0.000**	**0.240**	**-0.070*** **	**59.817**	**0.000**	**0.240**
Age Range (± 5 years) (McBride)	-0.073***	54.182	0.000	0.240	-0.085***	58.441	0.000	0.240

* at 10%-level significant ** at 5%-level significant *** at 1%-level significant Number of observations: 82544

Finally, I computed comparison income for all the specifications listed in table 5. Note that comparison income was recalculated for each sub-sample (transition countries, young and old respondents for the whole sample and for the German sub-sample). Note also that all reference income specifications were scaled down by a factor of 100. To obtain the results, I performed regression runs for each reference group specification, first on the whole sample and its sub-samples, thereafter on the sub-sample for Germany and its sub-samples. Results are shown and discussed in the following chapter.

6.4 Results

6.4.1 Whole Sample

Table 7 shows both the regression results without comparison income (1) and the regression results with comparison income (2) based on same 'education', 'gender' and 'country' (unweighted calculation)[63]. In this specification, comparison income affects individuals satisfaction significantly negatively with coefficient -0.055*** indicating a strong *social comparison effect* as expected.

As in the literature, absolute income has a positive effect on satisfaction. Higher income increases satisfaction, since the size of the coefficients is relatively small at the lower income bands (e.g. 0.168*** and 0.157*** for a weekly income between 70 and 120 Euro) and relatively high at the higher income bands (e.g. 0.658*** and 0.672*** for a weekly income being more than 2310 Euro). The coefficients of absolute income are only little affected by the

63 **A**ll results not presented here and in the following sub-chapters can be found at the hard disk (DVD) attached.

Table 7: Reference Income	(1)			(2)		
Ordered probit estimates	Coeff.	Wald-statistics	p-value	Coeff.	Wald-statistics	p-value
Socio-Demographic Variables						
Male	-0.107***	182.917	0.000	-0.074***	75.510	0.000
Age	-0.026***	326.075	0.000	-0.026***	327.944	0.000
Age^2	0.0003***	375.816	0.000	0.0003***	376.480	0.000
Married	0.224***	375.816	0.000	0.222***	344.873	0.000
Separated	-0.206***	45.952	0.000	-0.206***	46.057	0.000
Divorced	-0.013	0.599	0.439	-0.014	0.701	0.402
Widowed[a]	-0.038**	4.421	0.036	-0.038**	4.317	0.038
Children	-0.051***	31.878	0.000	-0.051***	31.490	0.000
Good health	0.459***	2719.681	0.000	0.457***	2701.099	0.000
Religion	0.086***	109.652	0.000	0.087***	111.333	0.000
Social	0.188***	558.233	0.000	0.187***	556.047	0.000
Perceived Safety	0.153***	275.682	0.000	0.156***	286.594	0.000
Geographical Variables						
Big city	-0.123***	47.692	0.000	-0.124***	48.690	0.000
Suburbs or outskirts of big city	-0.127***	51.136	0.000	-0.126***	49.799	0.000
Town or small city	-0.116***	48.938	0.000	-0.115***	48.178	0.000
Village resident[b]	-0.077***	21.693	0.000	-0.074***	20.173	0.000
Education						
Low secondary	-0.003	0.039	0.843	0.074***	22.398	0.000
Upper secondary	-0.004	0.072	0.788	0.120***	45.074	0.000
Post secondary	0.071***	6.871	0.009	0.229***	53.318	0.000
Tertiary[c]	0.014	0.953	0.329	0.257***	82.547	0.000
Activity (in the last seven days)						
Paid Work	-0.026**	4.124	0.042	-0.032**	6.115	0.013
Education	0.073***	18.135	0.000	0.072***	17.882	0.000
Unemployed	-0.279***	196.895	0.000	-0.284***	203.048	0.000
Permanently Disabled or Sick	-0.256***	133.156	0.000	-0.262***	139.058	0.000
Retired	0.075***	21.479	0.000	0.072***	20.143	0.000
Community or Civil Service	0.077	1.301	0.254	0.076	1.254	0.263
Housekeeping	0.037***	14.621	0.000	0.038***	15.360	0.000
Any Period of Unemployment and Work Seeking						
Lasted for more than 12 months	-0.126***	87.083	0.000	-0.125***	85.207	0.000
Within the last 5 years	-0.158***	132.869	0.000	-0.158***	134.081	0.000
Income						
70-120€	0.168***	84.864	0.000	0.157***	74.040	0.000
120-230€	0.252***	206.772	0.000	0.234***	176.972	0.000
230-350€	0.335***	321.916	0.000	0.315***	282.497	0.000
350-460€	0.391***	385.856	0.000	0.373***	349.595	0.000
460-580€	0.430***	427.895	0.000	0.414***	395.673	0.000
580-690€	0.466***	473.961	0.000	0.452***	445.406	0.000
690-1150€	0.521***	630.303	0.000	0.513***	611.395	0.000
1150-1730€	0.557***	546.825	0.000	0.561***	554.055	0.000
1730-2310€	0.547***	293.322	0.000	0.559***	305.409	0.000
>2310€[d]	0.658***	312.392	0.000	0.672***	325.433	0.000
Reference Income (Education, Gender, Country)		-		-0.055***	100.375	0.000
Year/ESS round/country dummies	Included			Included		
Pseudo R^2 (Cox and Snell)	0.240			0.241		
Number of obersations	82544			82544		

Excluded categories: [a] Never married [b] Countryside [c] Primary or less [d] <70€

* at 10%-level significant ** at 5%-level significant *** at 1%-level significant

introduction of comparison income.

The control variables of both models are in most of the cases of same size, direction and level of significance. The typical U-Shaped relation of individuals age and safisfaction can be found, since 'Age' is negative (-0.026***) and 'Age squared' (0.0003***) is positive in both models. To explain the U-shaped relation, Argyle (1999, p. 354) reviews that old people may feel more in control of their environment or may have lower aspirations. Another reason could be a sampling problem since unhappy people who have committed suicide or already died by illness are not contained in the sample anymore. In both models, 'Married' people are significantly more satisfied (0.224*** and 0.222***) with their lives than people who 'Never married', but 'Separated' people (both -0.206***) as well as 'Widowed' (both -0.038**) are worse off than people who have never been married. An explanation for this provides Argyle (1999, p. 361), who mentions that marriage is "the greatest source of social support, more than friends or kinship, including emotional and material support and companionship". Having 'Children' at home effects life satisfaction negatively (both -0.051***). A possible explanation is that children may increase the stress level (Argyle, 1999). To state a 'Good Health' status has a very strong positive effect on life satisfaction (0.459*** and 0.457***). Religious people report higher life satisfaction (0.086*** and 0.087***), which may be explained by the social support given by a religious membership and by better health, since church members drink and smoke less and have less promiscuous sex (Argyle, 1999, p. 366-367). Also people who state to be 'Social' (0.188*** and 0.187***) and feel safe (0.153*** and 0.156***) report higher life satisfaction. To live in a 'Big city' (-0.123*** and -0.124***) or in 'Outskirts of a big city' (-0.127*** and -0.126***) has a negative effect on life satisfaction. Generally, it seems that people feel more satisfied in rural than in urbanized areas.[64] Regarding the activities, doing 'Paid Work' reduces satisfaction little (-0.026** and -0.032**), being in 'Education' has a positive effect on life satisfaction (0.073*** and 0.072***), being 'Unemployed' (-0.279*** and -0.284***) and being 'Permanently disabled or sick' (-0.256*** and -0.262***) has a tremendous negative effect on life satisfaction. Doing 'Housekeeping' (0.037*** and 0.038***) and being 'Retired' (0.075*** and 0.072***) have a positive effect on life satisfaction. The variables capturing the long lasting effects of unemployment show clear negative signs. If an individual had anytime in its life, where unemployment 'lasted for more than 12 months', the individual still suffers from this life event by reporting lower satisfaction (-0.126*** and -0.125***). Similarly, people who state to had anytime of unemployment 'within last 5 years' also report lower satisfaction (both -0.158***).

64 **A** reason for this could be that unhappy people move to cities.

In contrast to other control variables, the variables 'Gender' and 'Education' were altered as reference income was introduced. Treating the variable for gender 'Male', the coefficient becomes smaller when comparison income is introduced (-0.107*** to -0.074***). Further, education dummies are insignificant (except 'Post secondary' 0.071***) when comparison income is not included. When reference income is included, higher education is transmitted into higher life satisfaction (ranging from 0.074*** for people with 'Low secondary' education to 0.257*** for people with 'Tertiary' education[65]). An explanation for this is that a better education has positive effects on life satisfaction through occupational status and social status, but may have negative effects through rising aspirations (Argyle, 1999, p. 355). However, the question is why the dummies for education suddenly turn significant when comparison income is introduced.

A possible explanation is that educational dummies already capture the social comparison effect in the model without reference income. Then, educational dummies do not show the net effect of education on happiness but rather the gross effect of both education and social comparisons. Introducing the reference income, educational dummies only show the net effect of education, while reference income captures the social comparison effect. Since the comparison income enters the equation negatively, the net effect should be still zero or close to. A higher level of education has a higher positive net effect on satisfaction, but, simultaneously, the reference income of more educated people is on average higher such that they are more heavily affected by social comparisons lowering their life satisfaction. However, when checking for other reference group specifications, it turns out that the dummies for education only turn significant when 'Education' is used as break variable.[66] Since there is a high correlation between Education and reference income when 'Education' is used as break variable[67], the result that educational dummies turn significant may simply a consequence of linear dependency.

Since the comparison income based on 'Education', 'Gender' and 'Country' affects life satisfaction negatively, the question was if this was the best specification to be made. Thus, I replicated the regression shown in table 7, but replaced comparison income. Table 8 summarizes the coefficients of comparison income based on several ways of calculation. Note that specifications solely based on 'Country', 'Education' or 'Gender' were redundant, since they were linear dependent with the dummy variables included (Country dummies, educational dummies or gender dummies) so that SPSS excluded these specifications

65 **'B**elow secondary' education is set to 0.
66 **A**ll regression results can be found at the DVD in the SPSS-Output-Files.
67 **S**ee Appendix B.

automatically.[68]

Table 8: Reference Groups (Whole Sample)	Reference Income calculated without weights				Reference Income calculated with weights			
Ordered probit estimates	(1)				(2)			
	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)
Reference Income By								
Age	-0.059***	58.372	0.000	0.240	-0.070***	59.817	0.000	0.240
Education, Age	-0.031***	29.391	0.000	0.240	-0.034***	27.189	0.000	0.240
Education, Gender	0.024	1.765	0.184	0.240	0.016	1.639	0.200	0.240
Education, Country	**-0.062*** **	**107.067**	**0.000**	**0.241**	**-0.062*** **	**108.766**	**0.000**	**0.241**
Age, Gender	-0.049***	48.372	0.000	0.240	-0.059***	50.393	0.000	0.240
Age, Country	-0.030***	49.825	0.000	0.240				
Gender, Country	-0.018	1.048	0.306	0.240	-0.023	1.151	0.283	0.240
Education, Age, Gender	-0.024***	21.381	0.000	0.240	-0.021***	15.722	0.000	0.240
Education, Age, Country	**-0.030*** **	**89.344**	**0.000**	**0.241**				
Education, Gender, Country	**-0.055*** **	**100.375**	**0.000**	**0.241**	**-0.056*** **	**103.415**	**0.000**	**0.241**
Age, Gender, Country	-0.025***	40.657	0.000	0.240				
Education, Age, Gender, Country	-0.023***	66.223	0.000	0.240				

* at 10%-level significant ** at 5%-level significant *** at 1%-level significant Number of observations: 82544

The results show that all but two comparison income specifications are significant at the 1%-level.[69] That two specifications turn out to be insignificant may have the reason that people do not compare themselves with other people who have the same education and have the same gender or with people who have the same gender and live in the same country.

There are differences in the specifications significant at the 1%-level. Taking the Wald-statistics as measure of preciseness, three specifications ('Education/Country'; 'Education/Age/Country' and 'Education/Gender/Country') seem to fit best as specification for the reference group. This can also be supported by the Pseudo-R^2, which is slightly higher for these three specifications (0.241 instead of 0.240). Following this results, people compare themselves most with people living in same country and having the same education as the respondent. The introduction of 'Age' or 'Gender' as break variable seems to weaken the level of significance slightly (Wald-Statistics drops from 107.067 to 89.344 or 100.375 respectively), although having also explanatory power (e.g. only 'Age' as break variable produces also highly significant results, but with lower Wald-statistics). Similar results were found when the reference income was calculated with weights applied.

68 **T**his problem is mainly caused by the fact that the ESS data-set only provides income bands and not income in continuous form. With income in continuous form, it would have been possible to calculate the ratio or the distance of absolute income and comparison income such that there would no linear dependency between reference income and the dummy variables in specification where only age, education or country would have been used as break variable.

69 **T**o compare the size of the coefficient is difficult, since the tresholds of the regressions are not exactly the same.

6.4.1.1 Looking for the Tunnel Effect: Young and Old respondents

FitzRoy et al. (2013) report that younger people are more likely to interpret the reference income as an informational value, which would indicate a *tunnel effect*. To check for the tunnel effect, the whole sample was divided in a sub-sample covering only respondents younger than 40 years and a sub-sample covering only respondents who are 40 years or older. Comparison income was recalculated based on the sub-samples and several regression runs were performed. To examine evidence for a tunnel effect, coefficients of the reference income should be positive. Table 9 shows the results for sub-sample containing the young respondents.

Table 9: Reference Groups (Whole Sample – Young) Ordered probit estimates	Reference Income calculated without weights (1)				Reference Income calculated with weights (2)			
	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)
Reference Income By								
Age	-0.025	1.223	0.269	0.196	-0.032	1.477	0.224	0.196
Education, Age	-0.024**	4.642	0.031	0.196	-0.020*	2.913	0.088	0.196
Education, Gender	0.008	0.024	0.876	0.196	0.015	0.205	0.651	0.196
Education, Country	**-0.039*** **	**14.466**	**0.000**	**0.196**	**-0.040*** **	**13.476**	**0.000**	**0.196**
Age, Gender	-0.020	0.947	0.331	0.196	-0.039	2.687	0.101	0.196
Age, Country	-0.004	0.211	0.646	0.196				
Gender, Country	-0.004	0.033	0.855	0.196	-0.018	0.389	0.533	0.196
Education, Age, Gender	-0.016	2.194	0.139	0.196	0.009	0.823	0.364	0.196
Education, Age, Country	**-0.019*** **	**10.143**	**0.001**	**0.196**				
Education, Gender, Country	**-0.030*** **	**11.527**	**0.001**	**0.196**	**-0.034*** **	**13.554**	**0.000**	**0.196**
Age, Gender, Country	0.004	0.312	0.576	0.196				
Education, Age, Gender, Country	-0.010**	4.134	0.042	0.196				

* at 10%-level significant ** at 5%-level significant *** at 1%-level significant Number of observations: 30073

Similar to the whole sample, the specifications 'Education/Country', 'Education/Age/Country' and 'Education/Gender/Country' turn out to fit best, since their Wald-statistics is relatively high and they are significant at the 1%-level. The size of the coefficients is closer to zero in all three cases than in the whole sample and in the sub-sample containing only the old (table 10), which could indicate twofold. First, if the assumption is made that the coefficients show only the "true social comparison effect", younger people seem to compare less than older people. Second, if the assumption is made that the coefficients show the net effect resulting from the difference of the social comparison effect and the tunnel effect, younger people may actually interpret comparison income as a informational value and as value for social comparisons. Hence, it is not clear to say, if the lower coefficients result from comparing less

or from interpreting comparison income as informational value. A clear indication for the tunnel effect would be a significant positive coefficient. Moreover, most coefficients in the sub-sample for young people are insignificant. Again, this could have two reasons. First, these specifications do not measure what they should so that the coefficients turn zero. Or second, comparison effect and tunnel effect clearly cancel each other out so that the coefficient turns zero. Lastly, note that the Pseudo-R^2 is lower than in the model containing the whole sample and lower than in the model containing only the old people (table 10).

Table 10: Reference Groups (Whole Sample – Old) Ordered probit estimates	Reference Income calculated without weights				Reference Income calculated with weights			
	(1)				(2)			
	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)
Reference Income By								
Age	-0.056***	26.142	0.000	0.267	-0.062***	20.058	0.000	0.267
Education, Age	-0.043***	19.792	0.000	0.267	-0.022**	4.445	0.035	0.266
Education, Gender	0.009	0.292	0.589	0.266	0.011	0.683	0.409	0.266
Education, Country	**-0.062*** **	**85.139**	**0.000**	**0.268**	**-0.058*** **	**81.775**	**0.000**	**0.267**
Age, Gender	-0.039***	15.464	0.000	0.267	-0.036***	9.049	0.003	0.266
Age, Country	-0.040***	50.900	0.000	0.267				
Gender, Country	-0.021	1.320	0.251	0.266	-0.032	2.404	0.121	0.266
Education, Age, Gender	-0.025***	11.311	0.001	0.266	-0.011	2.179	0.140	0.266
Education, Age, Country	**-0.037** **	**73.858**	**0.000**	**0.267**				
Education, Gender, Country	**-0.055*** **	**79.584**	**0.000**	**0.267**	**-0.051*** **	**74.872**	**0.000**	**0.267**
Age, Gender, Country	-0.034***	44.454	0.000	0.267				
Education, Age, Gender, Country	-0.029***	57.634	0.000	0.267				

* at 10%-level significant ** at 5%-level significant *** at 1%-level significant Number of observations: 52471

Regarding the sub-sample containing the old people (table 10), the results are roughly the same as the in whole sample. The main difference is that the Pseudo-R^2 is higher when only this sub-sample is treated. This indicates that the variables included explain better satisfaction of old people than of young people. The specifications best fitting ('Education/Country', 'Education/Age/Country' and 'Education/Gender/Country') are in line with the specifications of the whole sample and of the sub-sample containing only the young. Differences between weighted and unweighted calculation of the comparison income are small.

6.4.1.2 Looking for the Tunnel Effect: Transition Countries

As Senik (2008) and Caporale et al. (2009) show, there is some evidence that the tunnel effect mainly occurs in mobile and uncertain environments. To check this hypothesis, a sub-sample was created only containing transition countries, which can be most likely described as having a mobile and uncertain environment. Transition countries were selected according to the IMF specification (IMF, 2000), such that the sub-sample here contains the countries Bulgaria, Czech Republic, Poland, Hungary, Russia, Slovenia and Slovakia. Again, comparison income was recalculated based on the sub-sample observations. Table 11 shows the results.

Table 11: Reference Groups (Whole Sample – Transition)	Reference Income calculated without weights				Reference Income calculated with weights			
Ordered probit estimates	(1)				(2)			
	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)
Reference Income By								
Age	**-0.200***	**3.484**	**0.062**	**0.208**	**-0.190**	**2.692**	**0.101**	**0.208**
Education, Age	**0.055**	**1.734**	**0.188**	**0.208**	**-0.082***	**3.304**	**0.069**	**0.208**
Education, Gender	0.146	1.751	0.186	0.208	0.228	1.213	0.271	0.208
Education, Country	-0.034	0.939	0.333	0.208	-0.026	0.575	0.448	0.208
Age, Gender	**-0.162***	**3.376**	**0.066**	**0.208**	**-0.090**	**0.845**	**0.358**	**0.208**
Age, Country	-0.048	1.748	0.186	0.208				
Gender, Country	-0.015	0.021	0.885	0.208	0.025	0.051	0.822	0.208
Education, Age, Gender	0.031	0.883	0.348	0.208	0.049	1.725	0.189	0.208
Education, Age, Country	-0.014	0.625	0.429	0.208				
Education, Gender, Country	-0.034	1.153	0.283	0.208	-0.030	0.993	0.319	0.208
Age, Gender, Country	**-0.050***	**2.892**	**0.089**	**0.208**				
Education, Age, Gender, Country	-0.022	2.120	0.145	0.208				

* at 10%-level significant ** at 5%-level significant *** at 1%-level significant Number of observations: 15273

The results can be interpreted as follows. First, there is a difference in the coefficients between the reference income calculated without weights and with weights. Without weights, the specifications based on 'Age', 'Age/Gender' and 'Age/Gender/Country' turn out to be significant at the 10%-level. With weights applied, the specifications 'Education/Age' and 'Age/Gender/Country' are significant at the 10%-level. Since there are partly quite large differences between both calculation methods, the results are hard to interpret due to weight bias. Hence, only the specification 'Age/Gender/Country' seems to provide some valid information. Second, in contrast to the whole sample and young and old sub-sample, all specifications where 'Education' is included are insignificant (except 'Education/Age' specification with weights applied). On the one hand, this could mean that in transition countries people do not take educational concers into account when comparing to others. On

the other hand, this could be again a strong indication for the tunnel effect such that reference income formed by education gives a very valuable information about future income prospects canceling out the social comparison effect. Third, since no specification improves the Pseudo-R^2 of the model, it is questionable if the coefficients obtained have explanatory value or are just a result of linear dependency. This suspicion is also given by the fact that the coefficients are close to zero (insignificant) or just significant at the 10%-level.

6.4.2 German Sub-Samples

6.4.2.1 Whole German Sample

The next step was to analyze the German sub-sample. To do so, I considered only respondents from Germany. Instead of country dummies, I introduced dummies for the federal states as well as a East/West dummy. I recalculated comparison income based on the German sub-sample observations. Results are shown in table 12.

Table 12: Reference Groups (Germany) Ordered probit estimates	Reference Income calculated without weights				Reference Income calculated with weights			
	(1)				(2)			
	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)
Reference Income By								
Age	**-0.048***	**3.740**	**0.053**	**0.229**				
Education, Age	**-0.033****	**3.935**	**0.047**	**0.229**				
Education, Gender	**0.129***	**3.599**	**0.058**	**0.229**	**0.106***	**3.171**	**0.075**	**0.229**
Education, East/West	-0.001	0.001	0.981	0.228	0.002	0.004	0.953	0.228
Education, Federal States	0.031	1.336	0.248	0.228	0.033	1.526	0.217	0.228
Age, Gender	**-0.058*****	**8.195**	**0.004**	**0.229**				
Age, East/West	-0.017	0.713	0.399	0.228				
Age, Federal States	-0.003	0.041	0.839	0.228				
Gender, East/West	-0.198	2.339	0.126	0.228	-0.196	2.339	0.126	0.228
Gender, Federal States	-0.026	0.240	0.624	0.228	-0.026	0.234	0.628	0.228
Education, Age, Gender	-0.023	2.516	0.113	0.228				
Education, Age, East/West	-0.004	0.096	0.757	0.228				
Education, Age, Federal States	-0.003	0.092	0.762	0.228				
Education, Gender, East/West	0.260	0.537	0.464	0.228	0.031	0.827	0.363	0.228
Education, Gender, Federal States	0.030	2.470	0.116	0.228	0.031	2.615	0.106	0.228
Age, Gender, East/West	**-0.040****	**5.330**	**0.021**	**0.229**				
Age, Gender, Federal States	-0.011	1.060	0.303	0.228				
Education, Age, Gender, East/West	-0.002	0.024	0.877	0.228				
Education, Age, Gender, Federal States	-0.002	0.059	0.809	0.228				

* at 10%-level significant ** at 5%-level significant *** at 1%-level significant Number of observations: 6422

For the German sample, five specifications are significant at least at the 10%-level. Interestingly, the specification 'Education/Gender' has a positive coefficient, while all other significant specifications ('Age', 'Education/Age', 'Education/Gender', 'Age/Gender/East/West') have a negative coefficient. A possible explanation for this could be that people try to figure out their income prospects when forming their reference group with respect to 'Education' and 'Gender'. In contrast, when people form their reference group with respect to 'Age', they compare themselves socially with intimate people. Taking both observations together, using 'Age' as break variable may produce information about the strength of the social comparison effect, using 'Education' as break variable may give hints about the strength of the tunnel effect. Hence, since the 'Age/Education' specification is negative (-0.033^{**}), it could be argued that the social comparison effect dominates the tunnel effect in the German sample. To find out if this hypothesis is true, I filtered the observations again for young and old people. If there is a tunnel effect, positive coefficients should become larger and negative coefficients should turn zero or positive in the sub-sample for young Germans.

6.4.2.2 Looking for the Tunnel Effect: Young and Old respondents

The German sub-sample was split into two sub-samples, namely one containing only the respondents who are younger than 40 years and one sub-sample containing the respondents who are 40 years old or older. Comparison income was calculated again based on the observations of each sub-sample. Results are presented in tables 13 and 14.

In the sub-sample containing the young respondents, there is only one specification significant and has a positive sign (0.079^{***}), namely 'Education/Federal States'. Hence, there is evidence for the tunnel effect in the sample containing young Germans. Again, it is unclear if the insignificant coefficients are a result of bad specification or a result of the two opposing effects (social comparison effect and tunnel effect). On the one hand, there are several specifications in the full German sample (table 12) and in the sample containing only the old people (table 14) that indicate a social comparison effect, so that the insignificance of the coefficients in the sub-sample of young Germans may be due to the tunnel effect being roughly of the same size as the social comparison effect. On the other hand, the insignificance of the coefficients could be solely due to less observations (2067 instead of 6422 in the whole German Sub-Sample).

Table 13: Reference Groups (Germany – Young)	Reference Income calculated without weights				Reference Income calculated with weights			
Ordered probit estimates	(1)				(2)			
	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)
Reference Income By								
Age	-0.033	0.421	0.517	0.209				
Education, Age	-0.036	1.218	0.270	0.209				
Education, Gender	0.101	1.157	0.282	0.209	0.091	1.215	0.270	0.209
Education, East/West	0.115	1.471	0.225	0.209	0.111	1.717	0.190	0.209
Education, Federal States	**0.079*****	**6.913**	**0.009**	**0.211**	**0.081*****	**7.516**	**0.006**	**0.211**
Age, Gender	-0.033	0.557	0.456	0.209				
Age, East/West	-0.024	0.316	0.574	0.209				
Age, Federal States	0.023	0.830	0.362	0.209				
Gender, East/West	-0.341	2.537	0.111	0.209	-0.346	2.537	0.111	0.209
Gender, Federal States	-0.029	0.238	0.625	0.209	-0.029	0.232	0.630	0.209
Education, Age, Gender	-0.005	0.031	0.860	0.208				
Education, Age, East/West	-0.004	0.029	0.865	0.208				
Education, Age, Federal States	0.005	0.109	0.742	0.209				
Education, Gender, East/West	0.056	0.710	0.400	0.209	0.069	1.328	0.249	0.209
Education, Gender, Federal States	0.014	0.456	0.495	0.209	0.015	0.531	0.466	0.209
Age, Gender, East/West	-0.040	1.323	0.250	0.209				
Age, Gender, Federal States	0.020	1.169	0.280	0.209				
Education, Age, Gender, East/West	-0.001	0.003	0.956	0.208				
Education, Age, Gender, Federal States	0.000	0.000	0.991	0.208				

* at 10%-level significant ** at 5%-level significant *** at 1%-level significant Number of observations: 2067

Table 14: Reference Groups (Germany – Old)	Reference Income calculated without weights				Reference Income calculated with weights			
Ordered probit estimates	(1)				(2)			
	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)	Coeff.	Wald-statistics	p-value	Pseudo R^2 (Model)
Reference Income By								
Age	-0.041	1.136	0.286	0.250				
Education, Age	-0.037	1.690	0.194	0.250				
Education, Gender	0.123	1.808	0.179	0.250	0.096	1.400	0.237	0.250
Education, East/West	-0.027	0.275	0.600	0.250	-0.021	0.163	0.687	0.250
Education, Federal States	**-0.062****	**3.921**	**0.048**	**0.251**	**-0.059***	**3.555**	**0.059**	**0.251**
Age, Gender	**-0.056***	**3.793**	**0.051**	**0.251**				
Age, East/West	-0.037	1.374	0.241	0.250				
Age, Federal States	-0.023	1.373	0.241	0.250				
Gender, East/West	-0.165	1.241	0.265	0.250	-0.162	1.241	0.265	0.250
Gender, Federal States	0.025	0.189	0.663	0.250	0.024	0.185	0.667	0.250
Education, Age, Gender	-0.030	1.804	0.179	0.250				
Education, Age, East/West	-0.019	0.791	0.374	0.250				
Education, Age, Federal States	-0.013	1.073	0.300	0.250				
Education, Gender, East/West	-0.013	0.079	0.778	0.250	-0.007	0.028	0.868	0.250
Education, Gender, Federal States	-0.012	0.300	0.584	0.250	-0.011	0.276	0.600	0.250
Age, Gender, East/West	**-0.059****	**5.470**	**0.019**	**0.251**				
Age, Gender, Federal States	**-0.031****	**4.514**	**0.034**	**0.251**				
Education, Age, Gender, East/West	-0.011	0.416	0.519	0.250				
Education, Age, Gender, Federal States	0.006	0.371	0.542	0.250				

* at 10%-level significant ** at 5%-level significant *** at 1%-level significant Number of observations: 4355

For the old Germans, all significant coefficients are negative. Hence, there is evidence for the social comparison effect. In particular the specification 'Education/Gender', which had a positive coefficient in young sub-sample, is now significantly negative (-0.062**). This indicates that old people take the reference income based on education not as a chance to earn more in the future, but as a evaluation of own income position relatively to persons with the same level of education. Furthermore, old people form their reference group mainly according to 'Age/Gender', since specifications including both break variables are significantly negative outlining a clear social comparison effect.

6.4.3 Summary of the Empirical Results

The empirical analysis of the specifications of the reference groups shows some interesting insights. The following findings can be reported:

- The specification of the reference group matters. Dependent on the specification, the coefficient may be altered in sign, size and level of significance.
- On the European level, specifications are most significant with 'Country' used as break variable in the reference group specification. This indicates that people are more likely compare themselves within their own country and not across borders (table 8).
- Satisfaction models seem to fit better for old people, since pseudo-R^2 is higher. This indicates that the model including income, reference income and other control variables are better suitable to explain life satisfaction for old people than for young people. Life satisfaction of young people may be more strongly shaped by other unobserved factors (e.g. income of parents).
- Old people seem to interpret comparison income more seldom as informational value but rather as a value for social status concerns, since coefficients are always significantly negative or insignificant (table 10 and table 14).
- Coefficients for young people are generally higher (less negative or becoming insignificant or positive) (table 9 and table 13). This can be seen as a indication for the tunnel effect, in particular in the German sample containing only the young respondents.
- The tunnel effect is hard to indicate in transition countries, since coefficients of weighted and unweighted calculations of the reference income yield partly other

results. (table 11)

- The use of different break variables may measure different effects. In particular in the German sample, the introduction of 'Education' as break variable produces specifications with significantly positive coefficients ('Education/Gender' in table 12 with coefficient 0.129* and 'Education/Federal States' in table 13 with coefficient 0.079**). This may be an indication that 'Education' may be useful to measure the tunnel effect. A reason could be that people may orientate on the average income of people with the same educational level to form their income prospects. In contrast, the use of 'Age' as break variable always produces – if significant – negative coefficients. This may indicate that people evaluate their income position according to people of similar age.

These are the main results, which can be drawn from the empirical analysis. However, the results have to be evaluated critically, since there are a variety of problems and shortcomings of the study.

6.5 Problems and Shortcomings of the Study

'Age' as break variable. In the study, 'Age' was used as break variable according to 5-year age brackets. However, how 'Age' brackets are chosen is relatively arbitrary. It is worthwhile to remember that other authors used either 10-year age brackets (Ferrer-i-Carbonell, 2005; Oshio et al., 2009) or an area age ranges within (plus/minus 5 years) (McBride, 2001). Furthermore, theses ways of defining 'Age' as break variable are not exhaustive. For example, it could be assumed that people compare themselves with others, who are in range of being 10 years younger to 10 years older than the respondent. Alternatively, the idea that people compare mostly upwards[70] may be translated into a specification, where people compare only with people who are 5 or 10 years older. Of course, even more specifications are possible. Since the "true" age bracket or age range is not known, it remains unclear if the specification used here fits best. More research needs to be done on this question.

Household income. The income variable states household income of the respondents and not individual income. Therefore, actual wealth of the respondent cannot be measured accurately, since a specific household income has a different value for an individual living alone or a

70 **R**emember the finding that people compare mainly upward sketched in chapter 4.3.

family with children. This asymmetry is partially captured by the introduction of the control variables for the family status (e.g. 'Married' or 'Children'), but still leaves a huge gap in the distribution of the household income within the household.

Income bands. Since there are only income bands available in the ESS data-set, actual household income is not accurately measurable. This leads to imprecise results when generating reference income variables due to using midpoints of the income bands as a proxy.

Reference Income. Usually, reference income is stated as the share of individual income over average income of the reference group or as individual income minus average income of the reference group. Here, since income bands were used ordinally as dummies for absolute income, the reference income was approximated solely by the average income of the reference group. As a consequence, it was econometrically – due to linear dependency with the control variables included - not possible to calculate the coefficients of the reference income, where break variables were only 'Country', 'Gender' or 'Education'.

Weights. To calculate the reference income, it was necessary to aggregate the data. Correctly, it would be necessary to apply design and population weights to address imbalances in the sample. Since the weights are based on the original data-set, weights became incorrect after deleting 38 % of the original observations due to missing values and answers not interested in (e.g. 'Don't know'). Therefore, the calculation of the reference income – both with and without weights – may be somewhat biased.

Reference group specifications. The study focused on specifications containing 'Education', 'Gender', 'Age', 'Country', 'East/West' and/or 'Federal States' as break variable. Of course, these break variables are not exhaustive. It may be up to the researcher to use other break variables. As an example, one could argue that – as Van de Stadt et al. (1985) assume – people may compare most with people having the same employment status (Paid Work, Retired, Housekeeping etc.) as the respondent.

External reference group. The study focused only on the impact of an external reference group on satisfaction. According to theory, people may also compare to an internal reference point such as expected own income or past income. To get more realistic results, both internal and external reference groups/points should be included in the regression as far as there is

data availability (ideally panel data).

Control variables. Although most of the important control variables are included, there are theoretically more variables, which help to explain life satisfaction. On the socio-demographic level, Argyle (1999) reviews that ethnicity, leisure, social class, life events and activities and competencies have explanatory power. On a macroeconomic level, general unemployment, the crime rate, inflation and inequality have some additional explanatory power. The macroeconomic variables are partially addressed by country dummies.

7 Conclusion

In this master thesis, I investigated the specific role of reference groups by applying different specifications within an empirical analysis. The results show that different specifications may lead to different results, in particular regarding the significance of the coefficients.

On the multinational level, specifications turn mostly significant with 'Country' as break variable outlining that people mostly compare within their country. When looking for the tunnel effect on the multinational level, no clear evidence can be found, neither in the sub-set containing only young people nor in the sub-set containing transition countries.

On the German level, differentiation according to federal states or East- and West Germany improved only in some cases the significance of the coefficients. In contrast to the whole sample, evidence for the tunnel effect can be found in the sample containing only the young people, since the specification 'Education/Federal States' turned significantly positive while being significantly negative in the sub-sample containing the old respondents. This is also supported by the fact that specifications containing 'Age' and 'Gender' produce negative coefficients in the sub-sample containing the old, but becoming insignificant in the sub-sample containing the young.

Based on these observations, it is hard to say if there is a “best” specification for the reference group. The analysis showed that the explanatory power of the reference group specification depends also on the sub-sample treated (on the whole German sample, the specification 'Education/Federal States' does not improve the Pseudo-R^2 visibly, but does in the sub-sample for only young German respondents). That the results depend on the sub-sample treated may also indicate that reference groups change as individuals become older and it may indicate that it depends on the region treated what the reference group of people really is.

Lastly, it needs to be noted that the Pseudo-R^2 is generally quite low. Hence, one should take

care from deriving clear implications for personal life based on the results obtained, since a large part of the variety cannot be explained by the determinants. Instead, there may be other unobserved determinants, which may also have strong explanatory power. In addition, the study performed here had to face several obstacles, which could not be addressed. Ideally, a study to measure satisfaction should have panel data, continuous income bands, included internal reference points and an expanded set of control variables.

Appendix A - List of Variables

Variables (Relabeled)	Variables (Original ESS Label)	Definition	Mean Value (Whole Sample – 82544 Observations)
Satisfaction	stflife	All things considered, how satisfied are you with your life as a whole nowadays? Please answer using this card, where 0 means completely unsatisfied and 10 means completely satisfied.	7.06
Happy	happy	Taking all things together, how happy would you say you are? Please answer using this card, where 0 means extremely unhappy and 10 means extremely happy.	7.35
Male	gndr	Dummy variable: 1 Male; 0 otherwise	0.475
Age	agea	Age in years	47.57
Married	marital	Dummy variable: 1 Married; 0 otherwise	0.556
Separated	martial	Dummy variable: 1 Separated; 0 otherwise	0.015
Divorced	marital	Dummy variable: 1 Divorced; 0 otherwise	0.078
Widowed	martial	Dummy variable: 1 Widowed; 0 otherwise	0.091
Never married	martial	Dummy variable: 1 Never married; 0 otherwise	0.26
Children	chldhm	Dummy variable: 1 Children at home; 0 otherwise	0.407
Good health	health	Dummy variable: 1 very good or good health; 0 otherwise	0.672
Religion	rlgblg	Dummy variable: 1 Belonging to particular religion or denomination; 0 otherwise	0.624
Social	sclmeet	Dummy variable: 1 meet colleagues, relatives or friends several times a week or every day; 0 otherwise	0.639
Perceived Safety	aesfdrk	Dummy variable: 1 feel safety or very safety when walking alone in the local area after dark; 0 otherwise	0.772
Big City	domicil	Dummy variable: 1 Big City; 0 otherwise	0.188
Suburbs or outskirts of a big city	domicil	Dummy variable: 1 Suburbs or outskirts of a big city; 0 otherwise	0.14
Town or small city	domicil	Dummy variable: 1 Town or small city; 0 otherwise	0.301
Village resident	domicil	Dummy variable: 1 Village resident; 0 otherwise	0.307
Countryside	domicil	Dummy variable: 1 Countryside; 0 otherwise	0.064
Primary or less	edulvla	Dummy variable: 1 Primary or less; 0 otherwise	0.147
Low secondary	edulvla	Dummy variable: 1 Low secondary; 0 otherwise	0.192
Upper secondary	edulvla	Dummy variable: 1 Upper secondary; 0 otherwise	0.395
Post secondary	edulvla	Dummy variable: 1 Post secondary; 0 otherwise	0.023
Tertiary	edulvla	Dummy variable: 1 Tertiary; 0 otherwise	0.243
Paid Work	pdwrk	Dummy variable: 1 Paid Work; 0 otherwise	0.553
Education	edctn	Dummy variable: 1 In Education; 0 otherwise	0.086
Unemployed	uempla/uempli	Dummy variable: 1 Unemployed (actively or inactively); 0 otherwise	0.057
Permanently Disabled or Sick	dsbld	Dummy variable: 1 Permanently Disabled or Sick; 0 otherwise	0.032
Retired	rtrd	Dummy variable: 1 Retired; 0 otherwise	0.24
Community or Civil Service	cmsrv	Dummy variable: 1 Community or Civil Service; 0 otherwise	0.003
Housekeeping	hswrk	Dummy variable: 1 Housekeeping; 0 otherwise	0.238
Lasted for more than 12 months	uemp12m	Dummy variable: 1 Unemployed for a period for more than 12 months; 0 otherwise	0.114
Within the last 5 years	uemp5yr	Dummy variable: 1 Any time of unemployment within the last 5 years; 0 otherwise	0.124

Variables (Relabeled)	Variables (Original ESS Label)	Definition	Mean Value (Whole Sample – 82544 Observations)
<70€	hinctnt	Dummy variable: 1 <70€; 0 otherwise	0.083
70-120€	hinctnt	Dummy variable: 1 70-120€; 0 otherwise	0.081
120-230€	hinctnt	Dummy variable: 1 120-230€; 0 otherwise	0.138
230-350€	hinctnt	Dummy variable: 1 230-350€; 0 otherwise	0.133
350-460€	hinctnt	Dummy variable: 1 350-460€; 0 otherwise	0.115
460-580€	hinctnt	Dummy variable: 1 460-580€; 0 otherwise	0.1
580-690€	hinctnt	Dummy variable: 1 580-690€; 0 otherwise	0.094
690-1150€	hinctnt	Dummy variable: 1 690-1150€; 0 otherwise	0.156
1150-1730€	hinctnt	Dummy variable: 1 1150-1730€; 0 otherwise	0.066
1730-2310€	hinctnt	Dummy variable: 1 1730-2310€; 0 otherwise	0.02
>2310€	hinctnt	Dummy variable: 1 >2310€; 0 otherwise	0.013
Austria	cntry	Dummy variable: 1 Austria; 0 otherwise	0.048
Belgium	cntry	Dummy variable: 1 Belgium; 0 otherwise	0.049
Switzerland	cntry	Dummy variable: 1 Switzerland; 0 otherwise	0.056
Czech Republic	cntry	Dummy variable: 1 Czech Republic; 0 otherwise	0.031
Germany	cntry	Dummy variable: 1 Germany; 0 otherwise	0.078
Denmark	cntry	Dummy variable: 1 Denmark; 0 otherwise	0.046
Spain	cntry	Dummy variable: 1 Spain; 0 otherwise	0.036
Finland	cntry	Dummy variable: 1 Finland; 0 otherwise	0.042
France	cntry	Dummy variable: 1 France; 0 otherwise	0.02
United Kingdom	cntry	Dummy variable: 1 United Kingdom; 0 otherwise	0.058
Greence	cntry	Dummy variable: 1 Greece; 0 otherwise	0.041
Hungary	cntry	Dummy variable: 1 Hungary; 0 otherwise	0.015
Ireland	cntry	Dummy variable: 1 Ireland; 0 otherwise	0.034
Italy	cntry	Dummy variable: 1 Italy; 0 otherwise	0.007
Luxembourg	cntry	Dummy variable: 1 Luxembourg; 0 otherwise	0.021
Netherlands	cntry	Dummy variable: 1 Netherlands; 0 otherwise	0.061
Norway	cntry	Dummy variable: 1 Norway; 0 otherwise	0.063
Poland	cntry	Dummy variable: 1 Poland; 0 otherwise	0.053
Portugal	cntry	Dummy variable: 1 Portugal; 0 otherwise	0.04
Sweden	cntry	Dummy variable: 1 Sweden; 0 otherwise	0.064
Slovenia	cntry	Dummy variable: 1 Slovenia; 0 otherwise	0.033
Slovakia	cntry	Dummy variable: 1 Slovakia; 0 otherwise	0.019
Turkey	cntry	Dummy variable: 1 Turkey; 0 otherwise	0.018
Russia	cntry	Dummy variable: 1 Russia; 0 otherwise	0.022
Island	cntry	Dummy variable: 1 Island; 0 otherwise	0.005
Israel	cntry	Dummy variable: 1 Israel; 0 otherwise	0.02
Cyprus	cntry	Dummy variable: 1 Cyprus; 0 otherwise	0.008
Bulgaria	cntry	Dummy variable: 1 Bulgaria; 0 otherwise	0.012
ESS Round 1	essround	Dummy variable: 1 ESS1; 0 otherwise	0.332
ESS Round 2	essround	Dummy variable: 1 ESS2; 0 otherwise	0.339
ESS Round 3	essround	Dummy variable: 1 ESS3; 0 otherwise	0.329
2002	inwyr	Dummy variable: 1 2002; 0 otherwise	0.237
2003	inwyr	Dummy variable: 1 2003; 0 otherwise	0.095
2004	inwyr	Dummy variable: 1 2004; 0 otherwise	0.219
2005	inwyr	Dummy variable: 1 2005; 0 otherwise	0.103
2006	inwyr	Dummy variable: 1 2006; 0 otherwise	0.277
2007	inwyr	Dummy variable: 1 2007; 0 otherwise	0.069

Appendix B - Correlations (Education and Reference Group Specifications)

Correlation (Whole Sample) **Education vs. Reference Income**	Reference Income calculated without weights		Reference Income calculated with weights	
Spearman Correlation Coefficient	(1)		(2)	
	Coeff.	p-value	Coeff.	p-value
Reference Income By				
Age	0.234***	0.000	0.238***	0.000
Education, Age	0.857***	0.000	0.764***	0.000
Education, Gender	0.966***	0.000	0.902***	0.000
Education, Country	0.511***	0.000	0.500***	0.000
Age, Gender	0.239***	0.000	0.242***	0.000
Age, Country	0.223***	0.000		
Gender, Country	0.145***	0.000	0.137***	0.000
Education, Age, Gender	0.833***	0.000	0.751***	0.000
Education, Age, Country	0.481***	0.000		
Education, Gender, Country	0.513***	0.000	0.494***	0.000
Age, Gender, Country	0.231***	0.000		
Education, Age, Gender, Country	0.470***	0.000		

* at 10%-level significant ** at 5%-level significant *** at 1%-level significant

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